REMARKS

A Substitute Specification and Abstract is submitted herewith to place the case in better English form. The Substitute Specification and Abstract contains no new matter. In order that the examiner can satisfy himself in this regard, also submitted herewith is a marked-up copy of the original Specification and Abstract from which the Substitute Specification and Abstract was typed.

Respectfully submitted,

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~~DESCRIPTION~~

AUTOMATIC TRANSMISSION

CROSS-REFENCE TO RELATED APPLICATION

The present application has been filed under 35 USC 371 as a national phase of International Application No. , filed , and claims priority of Japanese Application No. , filed , the teachings of which are incorporated by reference herein in its entirety, inclusive of U.S.

Technical Field

The present invention relates to an automatic transmission ~~incorporated in~~ for a vehicle, and more specifically, ~~it relates to the placement construction~~ to of an automatic transmission that can shift between multiple speeds, ~~by being capable~~ with the capability of input of reduced speed rotation to a selected one of the rotation components of a planetary gear unit.

Background Art

~~Generally, there is known an~~ One type of conventional automatic transmission ~~incorporated in a vehicle or the like which~~ comprises a planetary gear unit with two rows of linked planetary gears, and planetary gearing that ~~can~~ outputs ~~the reduced~~ rotation ~~wherein the rotation~~ at a speed reduced from that of the input shaft, ~~is reduced~~ (for example, see, Japanese Unexamined Patent application Publication No. 4-125345 and Japanese Unexamined Patent application Publication No. 2000-274498). These publications disclose automatic transmissions providing, for example, six forward speed ~~levels~~ and one reverse speed ~~level, by being capable of~~ with input of ~~reduced~~ rotation ~~from~~ at a speed reduced by ~~the~~ planetary gearing via a clutch, ~~to, for example,~~ one of four rotation components of a planetary gear unit, ~~that has four rotation components~~.

In recent years, multi-staging of automatic transmissions has been desired from the perspective of improved fuel efficiency, due to environmental problems and so forth. However, in general, multi-staging results in a larger automatic transmission due to the increased number of components, while ease of mounting on a vehicle, a compact automatic transmission is desired.

The above-mentioned conventional automatic transmission comprises two clutches for inputting the rotation of the input shaft into a rotary component of the planetary gear unit, and planetary gearing for reducing the speed of rotation of the input shaft for input into the rotary component of the planetary gear unit. However, where a hydraulic servo that controls the engagement of the clutches is located between the planetary gear unit and the planetary gearing, the unit for transmitting the reduced speed output by the planetary gearing to a rotary component of the planetary gear unit must be axially elongated.

The elongated member transmitting the reduced speed rotations and a large torque is elongated, and providing an elongated member that can withstand such large torque requires fabrication from a relatively thick material, which prevents compact automatic transmission. Further, the weight of such a unit is increased.

~~automatic transmission be prevented, but~~ , the inertia (~~force of~~ inertia force is) would increase~~d~~, ~~decreasing~~ is decreased the controllability of the automatic transmission and ~~the shock of~~ speed change shocks ~~would~~ occur more easily.

Further, for example, in order to engage or disengage transfer of the reduced speed rotation ~~output~~ to the planetary gear unit from the planetary gear~~ing~~, a clutch or brake must be provided. In the case that a clutch is provided, this clutch together with ~~and~~ the above-~~described~~ mentioned two clutches, ~~in other words~~ total three clutches in all are necessary. In general, a clutch has a ~~drum-shaped member~~ clutch drum that transmits the input rotation to the friction plates, and therefore, with a problem such as relative rotation ~~for example~~, supply of oil pressure to the oil chamber of the oil pressure servo of the clutch must be ~~made~~ from the mid-section of the automatic transmission.

However, if ~~those~~ The above-mentioned three clutches are ~~configured~~ located on one side ~~in the~~ axial ~~direction~~ of the planetary gear unit for example, oil lines for supplying oil pressure to three respective hydraulic ~~oil pressure~~ servos ~~are constructed~~ must be provided in triplicate in the mid-section of the automatic transmission for example, and the configuration of the oil lines become~~s~~ complicated.

SUMMARY OF THE INVENTION

Accordingly, ~~the~~ an object of the present invention is to provide an automatic transmission that achieves multi-staging, and yet is ~~realizes~~ reduc~~tion~~ed in size~~, by placement configuration.~~

~~Further,~~ Another object of the present invention is to provide an automatic transmission wherein reduced rotation output means and a first clutch are ~~configured~~ located on one axial ~~in the axial direction~~ of the planetary gear unit, and the second clutch is ~~configured~~ located on the other side ~~in the~~ axial ~~direction~~ of the planetary gear unit, so as to provide solutions of ~~to~~ the above-mentioned problems.

~~Disclosure of Invention~~

Accordingly, The present invention ~~according to Claim 1 is~~ provides an automatic transmission comprising: an input shaft that rotates ~~based on output~~ with the rotation output from of a drive source; a planetary gear unit comprised of first, second, third, and fourth ~~rotation~~ ry components; reduced speed rotation output means ~~capable of~~ for reducing the speed of the input rotation from the input shaft and for outputting ~~a reduced~~ at the reduced speed rotation to the first ~~rotation~~ ry component ~~from the input shaft wherein the rotation speed is reduced~~; a first clutch that selectively connects ~~links~~ the input shaft and the second ~~rotation~~ ry component, ~~in a manner capable of disengaging~~; a second clutch that selectively connects ~~links~~ the input shaft ~~and~~ will the third ~~rotation~~ ry component, ~~in a manner capable of disengaging~~; and an output unit that outputs the rotation of the fourth ~~rotation~~ ry component to a drive wheel transmission mechanism, ~~wherein~~ The reduced speed rotation output means and the first clutch are ~~configured~~ located on one side ~~in the~~ axial ~~direction~~ of the planetary gear unit, and ~~wherein~~ the second

clutch is ~~configured~~ located on the other side ~~in the~~ axial ~~direction~~ of the planetary gear unit.

Accordingly, the reduced speed rotation output means and planetary gear unit can be disposed closer to each other as ~~in~~ compared ~~ison~~ with a case wherein the first clutch and second clutch, for example, are ~~configured~~ located between the reduced speed rotation output means and the planetary gear unit, while ~~enabling realizing~~ providing at least five speeds ~~levels~~ forward and one speed ~~level~~ reverse, ~~and~~ Further, the ~~linking~~ transmitting member ~~for~~ which transmit~~ting~~s the reduced speed rotation can be made relatively short~~er~~, thereby enabling ~~forming~~ the automatic transmission to be made ~~in a~~ more compact~~manner~~.

Further, because the ~~linking~~ transmitting member for transmitting the reduced speed rotation can be made relatively short~~er~~, ~~this~~ it can be more lightweight, and further, because the inertia ~~of inertia~~ (force initial) ~~can be smaller~~ is reduced, the controllability of the automatic transmission can be improved, and the occurrence of speed change shock can be reduced.

Further, ~~for example~~ in the case that the reduced speed rotation output means has a clutch, three clutches are ~~configured~~ in all are required, but compared to the case wherein the three clutches are ~~configured~~ located on one side of the planetary gear unit, the construction of the oil lines supplying the ~~oil~~ ~~pressure~~ hydraulic servos of those clutches is easier, ~~and~~ the manufacturing process ~~can be~~ is simplified and the cost is

reduced.

The present invention ~~according to Claim 2 is configured~~ may include further ~~comprising~~ a ~~linking~~ transmitting member for linking the reduced speed rotation output means and the planetary gear unit, wherein the first clutch is ~~configured on the inner circumference side~~ located radially inward of the ~~linking~~ transmitting member.

~~The present invention according to Claim 3 is configured with~~ the reduced speed rotation output means may include ~~further comprising~~ an input ~~rotation component~~ rotary element for ~~inputting~~ receiving input of rotation in a continuous manner of the input shaft ~~at all times~~, a fixed element ~~a fixing component for fixing rotation at all times~~, ~~a speed reduction planetary gear that has~~ a reduced speed rotary element ~~component that rotates at the reduced rotation~~, and a third clutch ~~that can link~~ for controlling connection, through the ~~linking~~ transmitting member, between the reduced rotary element ~~rotation component~~ and the first rotary ~~rotation~~ component ~~in a manner capable of disengaging~~, wherein the reduced speed rotation is transmitted to the first rotary ~~rotation~~ component by engagement of the third clutch ~~engaging~~.

The present invention ~~according to Claim 4 has~~ may have the first clutch ~~configured on the inner circumference side~~ located radially inward of the third clutch.

Accordingly, the third clutch, which must transmit a relatively large torque ~~to transmit~~ at the reduced speed ~~rotation~~, can be ~~configured~~ located on the outer circumferential side, and this third clutch and ~~the oil pressure~~ its hydraulic servo ~~thereof~~ can have a

larger diameter. ~~Particularly~~ More specifically, the pressure receiving area of the oil chamber of the ~~oil pressure~~ hydraulic servo can be increased, and the capacity for torque transmission of this third clutch ~~can be~~ is thereby increased. However, by ~~configuring~~ locating the first clutch, which can have a small~~e~~r capacity for torque transmission compared to the third clutch, on the inner circumferen~~ce~~tial side, the automatic transmission can be formed more compact.

~~The present invention according to Claim 5 is configured with~~ The third clutch ~~comprising a~~ includes friction member~~s~~, ~~and~~ a drum unit and a hub unit that link~~s~~ ~~with~~ through the friction member~~s~~, ~~wherein, the hub unit links~~ with the reduced~~v~~ speed rota~~tion~~ry component. The drum unit forms ~~an oil pressure~~ a hydraulic servo with a piston sealed in an oil-tight manner, and links with the first rota~~tion~~ry component~~s~~, ~~and~~ the first clutch is ~~configured on the inner circumference side~~ located radially inward of the drum ~~member~~ unit.

~~The present invention according to Claim 6 is configured with~~ The friction member~~s~~ of the third clutch are preferably located ~~on the outer circumference side~~ radially outward of the speed reduct~~ion~~ing planetary gear~~s~~, ~~wherein an oil pressure~~ with the hydraulic servo of the third clutch ~~is~~ disposed adjoining the speed reduc~~tion~~ing planetary gear ~~in~~ on the opposite axial side of the planetary gear unit, ~~in the axial direction~~.

~~The present invention according to Claim 7 is configured with an oil pressure~~ The hydraulic servo of a first brake, for

~~retaining~~ braking the first rotating component of the planetary gear unit to which reduced rotation is input, ~~configured on the outer circumference~~ is located radially outward of the ~~oil pressure~~ hydraulic servo of the third clutch.

~~The present invention according to Claim 8 is configured with~~ The reduced rotation output means ~~further comprising~~ may include an input rotation component capable of inputting rotations of the input shaft, a fixing component for fixing rotations at all times, a speed reduction planetary gear unit that has a reduced rotation component that links to the first rotation component at all times, and rotates at the reduced rotation, and a third clutch that can link the linking member between the input shaft and the input rotation component in a manner capable of disengaging; wherein the reduced rotation is transmitted to the first ~~rotation component by the third clutch engaging~~

(repeats p. 7-18)

~~The present invention according to Claim 9 is configured with a fixing component~~ The intermediate element of the speed reduction planetary gear is fixed ~~and configured on~~ to a first boss ~~unit~~ extending from one ~~edge of a~~ side wall of a case ~~an oil pressure~~ with the hydraulic servo of the third clutch ~~is configured~~ mounted on the ~~outside of~~ the first boss. Likewise, the ~~units an oil pressure~~ hydraulic servo of the second clutch is ~~configured~~ located on the outside of the second boss ~~unit~~ that extends from another ~~edge of a~~ side wall of the case. The first clutch is ~~configured~~ located adjoined ~~to~~ the

planetary gear ing and ~~also comprises a~~ includes friction member s, ~~and an~~ ~~oil pressure~~ a hydraulic servo for ~~pressurizing~~ engaging the friction member s, and a drum unit and hub unit ~~configured~~ integral ly with the ~~oil pressure~~ hydraulic servo, ~~and~~ wherein the drum unit is linked with the input shaft.

~~The present invention according to Claim 10 is configured~~ In one embodiment, includes with the reduced speed rotation output means ~~further comprising~~ an input rotation component ry element for ~~inputting~~ receiving input of rotation s of the input shaft, ~~a fixing component for fixing~~ an fixable element for being fixed against rotation s, a ~~speed reduction planetary gear that has a~~ reduced speed rotation ~~component~~ ry element that is ed links to the first rotation component at all times, and rotates at the reduced speed ~~rotation~~, a third clutch for selectively connecting, through the transmitting ~~that can link the linking~~ member, ~~between~~ the input shaft and the input rotation ry element ~~component in a manner capable of disengaging~~, and a third brake for ~~capable of~~ fixing the fixable element against the rotation s ~~of the fixing component~~; wherein the reduced speed rotation is transmitted to the first rotation ry component by engagement of the third clutch and the third brake, In this embodiment ~~engaging.~~

~~The present invention according to Claim 11 is configured further comprising: a linking member for linking the reduced rotation output means and the planetary gear unit; wherein~~ the third clutch may be is disposed ~~on the inner circumference side~~ radially inward of the transmitting ~~linking~~ member.

~~With the present invention according to Claim 12,~~ the first clutch and the third clutch may be located axially ~~are configured~~ adjacent ~~in~~

~~the axial direction, on the inner circumference side~~ and radially inward of the ~~linking~~ transmitting member.

~~The present invention according to Claim 13 is configured with~~ The third clutch ~~comprising a~~ includes friction member and ~~an oil pressure~~ a hydraulic servo for ~~pressurizing~~ engaging the friction member, wherein the ~~oil pressure~~ hydraulic servo is ~~configured~~ located on the ~~opposite~~ side ~~in the axial direction~~ of the speed ~~reduction~~ (second) planetary gear unit axially opposite the first planetary gear unit as to the friction ~~member~~; and wherein a drum unit that ~~configures a~~ forms the cylinder of the ~~oil pressure~~ hydraulic servo is linked with the input shaft.

~~With the present invention according to Claim 14,~~ The ~~oil pressure~~ hydraulic servo of the third clutch ~~is configured~~ may be located adjoining the ~~oil pressure~~ hydraulic servo of the first clutch, between the ~~oil pressure~~ hydraulic servo of the first clutch and the friction ~~material~~ plates of the third clutch.

~~The present invention according to Claim 15 is configured further comprising: a linking member for linking the reduced rotation output means and the planetary gear unit; wherein~~ The third brake ~~is configured on the opposite~~ may be located on the second PR axially opposite side ~~in the axial direction~~ of the planetary gear unit ~~as to~~ the ~~speed reduction~~ first (ring) planetary gear unit PU.

~~The present invention according to Claim 16 is configured with~~ The ~~oil pressure~~ hydraulic servo of the third brake ~~provided~~ may be formed in ~~a~~ the case.

~~The present invention according to Claim 17 is~~

configured with the third clutch comprising a friction member and an oil pressure servo for pressurizing the friction member; wherein the oil pressure servo is configured on the opposite side in the axial direction of the speed reduction planetary gear as to the friction member; and wherein a drum unit that configures a cylinder of the oil pressure servo is linked with the input shaft.

The present invention according to Claim 18 is configured with the reduced rotation output means further comprising an input rotation component for inputting rotations of the input shaft, a fixing component for fixing rotations of a speed reduction planetary gear that has a reduced rotation component that rotates at the reduced rotation and that is connected to the first rotating component at all times, and a third brake capable of fixing the rotations of the fixing component, wherein the reduced rotation is transmitted to the first rotation component by engaging the third brake.

With the present invention according to Claim 19, the third brake is configured on the opposite side in the axial direction of the planetary gear unit as to the speed reduction planetary gear;

wherein the oil pressure servo of the third brake is provided in a case.

The present invention according to Claim 20 is

configured such that six forward speed levels and one reverse speed level can be achieved, and in the case of the fourth forward speed level the first clutch and the second clutch are engaged.

The automatic transmission of the foregoing embodiment This achieves six forward speeds and one reverse speed, and in fourth speed forward the first and second clutches are engaged together, that is to say directly coupled in fourth speed forward. Therefore, in fifth speed forward and sixth speed forward, the gear ratio can be specified to a high ratio, and particularly when mounted on a vehicle, in the event that the vehicle is running at a high speed, the engine revolutions can be lowered, and this contributes to the quietness of the vehicle while running at a high speed.

The present invention according to Claim 21 is configured such that, in a speed line chart illustrating the revolutions of the first, second, third, and fourth rotation components with the vertical axis, and the gear ratio of the first, second, third, and fourth rotation components with the horizontal axis in a corresponding manner; the first rotation component to which the reduced rotation is input is positioned at the farthest edge in the horizontal direction, with the third rotation component, the fourth rotation component linked to the output member, and the second rotation component, corresponding in that order.

With the present invention according to Claim 22, the

The first preferably unit planetary gear unit is a multiple ~~type~~ planetary gear, comprising a first sun gear, a long pinion which meshes with the first sun gear, a short pinion which meshes with the long pinion, a carrier for rotatably supporting the long pinion and the short pinion, a second sun gear meshing with the short pinion, and a ring gear meshing with the long pinion. In such an embodiment ~~wherein~~ the first rotation component is the first sun gear which receives ~~capable of~~ inputting the reduced speed rotation from ~~of~~ the reduced speed rotation output means, and which can be ~~is capable of being~~ fixed against rotation by ~~the retaining~~ engagement of the first brake, ~~and wherein~~ the second rotation component is the second sun gear which receives ~~capable of~~ inputting of the rotations of the input shaft upon ~~by the~~ engagement of the first clutch, ~~and wherein~~ the third rotation component is the carrier which receives ~~capable of~~ inputting of the rotations of the input shaft upon ~~by the~~ engagement of the second clutch, and which is ~~capable of being~~ fixed against rotation by ~~the retaining~~ engagement of the second brake, and ~~wherein~~ the fourth rotation component is the ring gear linked to the output member.

The ~~present invention according to Claim 23 comprises~~ automatic transmission according another embodiment includes a pair of the planetary gear units each comprising a first sun gear, a second sun gear linked to the first sun gear, a first carrier meshing with the first sun gear, a second carrier meshing with the second sun gear, a first ring gear linked to the second carrier, and a second ring gear meshing with the second carrier. In this embodiment ~~wherein~~ the first rotation

component is the second ring gear ~~capable of~~ inputting the reduced rotation ~~of~~ the reduced rotation output means, and which is capable of being fixed by ~~the retaining~~ of the first brake, and ~~wherein~~ the second rotation component is the first sun gear and the second sun gear ~~capable of~~ inputting the rotations of the input shaft ~~by the~~ engaging of the first clutch, ~~and wherein~~ the third rotation component is the second carrier and the first ring gear ~~capable of~~ inputting the rotations of the input shaft ~~by the~~ engaging of the second clutch, and ~~also capable of being~~ fixed by ~~the retaining~~ of the second brake, ~~and wherein~~ the fourth rotation component is a first carrier linked to the output member.

~~The present invention according to Claim 24 is~~ configured ~~wherein~~, in ~~the~~ first speed forward, the first clutch ~~is engaged~~ and the second brake ~~is retained~~; ~~and wherein,~~ in ~~the~~ second speed forward, the first clutch ~~is engaged~~ and the first brake ~~is retained~~; ~~and wherein,~~ in ~~the~~ third speed forward, reduced rotation is input to the first rotation component from the reduced rotation output means, and the first clutch is engaged; ~~and wherein,~~ in ~~the~~ fourth speed forward, the first clutch and the second clutch are both engaged; ~~and wherein,~~ in ~~the~~ fifth speed forward, reduced rotation is input to the first rotation component from the reduced rotation output means, and the second

clutch is engaged; ~~and wherein~~, in the sixth speed forward, the second clutch ~~is engaged~~ and the first brake ~~is~~ ~~retained~~; and ~~wherein~~, in the first speed reverse, reduced rotation is input to the first ~~rotation~~ component from the reduced rotation output means, and the second brake is ~~retained~~, ~~whereby~~ six forward speed ~~levels~~ and one reverse speed ~~level can be achieved~~.

~~With the present invention according to Claim 25, six forward speed levels and one reverse speed level can be achieved, and in the case of the~~ fifth forward speed ~~level~~ the first clutch and the second clutch ~~are~~ engaged. ~~Accordingly, this~~ achieves six forward speeds and one reverse speed, and ~~at fifth speed forward the first and second clutches are engaged together, that is to say~~ directly coupled ~~at fifth speed forward~~. Therefore, between first speed forward and fourth speed forward, the ~~width~~ of the gear ratios can be ~~specified in detail~~, and ~~particularly when mounted on a vehicle, in the event that~~ the vehicle is running at a low to moderate speed, the engine can be ~~utilized with~~ better ~~revolutions~~, and fuel ~~cost~~ can be reduced.

~~improved with the vehicle running at a low to moderate speed.~~

~~The present invention according to Claim 26 is~~ configured such that, in a speed line chart illustrating the revolutions of the first, second, third, and fourth rotation components with the vertical axis, and the gear ratio of the

first, second, third, and fourth rotation components with the horizontal axis in a corresponding manner; the first rotation component to which the reduced rotation is input is positioned at the farthest edge in the horizontal direction, with the fourth rotation component linked to the output member, the third rotation component, and the second rotation component, corresponding in that order.

Alternatively, in embodiments wherein ~~With the present invention according to Claim 27,~~ the planetary gear unit is a multiple ~~type~~ planetary gear unit, ~~comprising a first sun gear, a long pinion which meshes with the first sun gear, a short pinion which meshes with the long pinion, a carrier for rotationally supporting the long pinion and the short pinion, a second sun gear meshing with the short pinion, and a ring gear meshing with the long pinion, wherein~~ the first rotation component is the second sun gear ~~capable of~~ which receives input of the reduced speed rotation of the reduced speed rotation output means; ~~and wherein the rotation component~~ is ~~the~~ a carrier ~~capable of~~ which receives input of the rotations of the input shaft by ~~the~~ engaging element of the first clutch, and which is ~~capable of being~~ fixed against rotation by ~~the retaining~~ engagement of the first brake; ~~and wherein~~ the third rotation component is the first sun gear ~~capable of~~ which receives input of the rotations of the input shaft ~~by the~~ upon engaging element of the second clutch, and which is ~~capable of being~~ fixed against rotation ~~by the retaining~~ by engagement of the second brake; and ~~wherein~~ the fourth rotation component is the ring

~~gear linked to the output member.~~

In the foregoing alternative embodiment

~~The present invention according to Claim 28 is~~ ~~configured such that~~, in ~~the~~ first speed forward, reduced speed rotation is input to the first rotation component from the reduced speed rotation output means, and the first brake is engaged ~~retained~~; ~~and wherein,~~ in ~~the~~ second speed forward, reduced speed rotation is input to the first rotation component from the reduced speed rotation output means, and the second brake is engaged ~~retained~~; ~~and wherein,~~ in ~~the~~ third speed forward, reduced speed rotation is input to the first rotation component from the reduced speed rotation output means, and the second clutch is engaged; ~~and wherein,~~ in ~~the~~ fourth speed forward, reduced speed rotation is input to the first rotation component from the reduced speed rotation output means, and the first clutch is engaged; ~~and wherein,~~ in ~~the~~ fifth speed forward, the first clutch and the second clutch are both engaged; ~~and wherein,~~ in ~~the~~ sixth speed forward, the first clutch ~~is engaged~~ and the second brake are both engaged ~~is retained~~; and ~~wherein,~~ in ~~the~~ first speed reverse, the second clutch ~~is engaged~~ and the first brake are engaged ~~is retained~~, ~~whereby~~ six forward speed ~~levels~~ and one reverse speed ~~level can be achieved.~~ Thus, this embodiment also provides

~~The present invention according to Claim 29 is~~ ~~configured with~~ the first clutch may be located on the ~~configured on the opposite~~ side ~~in the axial direction~~ of the first planetary gear unit axially opposite ~~as to~~ the speed reducing second planetary gear unit.

In the embodiments mentioned above the "fixed element" may be a carrier fixed to the case, optionally a boss on the interior of the case, and carrying pinions meshed with the input rotary element and the reduced speed rotary element. Likewise, the "fixable element" may be a carrier which can be fixed against rotation by engagement of a brake and which carries pinions meshed with the input rotary element and the reduced speed rotary element.

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~~With the present invention according to Claim 30~~, the first clutch ~~is a clutch which~~ engages at ~~a~~ relatively low to medium speed ~~level~~.

Accordingly, when this second clutch is disengaged at relatively high speed ~~levels~~ or ~~at the~~ reverse ~~speed level~~, ~~particularly~~ the unit linking this second clutch and the third rotation component rotates at a relatively high speed or in the opposite direction. On the other hand, a case may occur wherein the ~~linking~~ member, that transmits the reduced rotation from the reduced rotation output means, rotates at a reduced ~~rotational~~ speed or is engaged, and the difference in ~~revolutions~~ speeds may be great. However, because this second clutch is located on the ~~opposite~~ side of the reduced rotation output means ~~that~~ the first planetary gear unit, ~~that is to say,~~ the unit ~~with~~ rotating at a relatively high ~~rotation~~ speed or reverse rotation and the unit ~~with~~ rotating at the reduced ~~rotation~~ speed of ~~this~~ the reduced speed rotation output means (particularly the linking member) can be separated ~~and configured.~~ For example, compared to the case wherein those units are ~~configured with~~ arranged in a multiple axis ~~construction~~ configuration and are in contact, decrease in efficiency of the automatic transmission due to relative rotation between these units can be prevented.

~~With the present invention according to Claim 31~~, the second clutch ~~is a clutch that~~ is engaged ~~at the~~ in reverse ~~level~~.

Accordingly, when ~~this~~ the second clutch is engaged in ~~the~~

reverse ~~level~~, the reduced rotation unit (particularly the ~~linking~~ member) of the reduced rotation output means rotates in reverse, ~~direction~~ ~~on the other hand,~~ a case ~~may occur~~ wherein the unit linking this second clutch and the third rotation component ~~becomes the~~ rotation of the input shaft due to ~~this~~ second clutch being engaged, ~~and~~ the difference in ~~revolutions~~ may be great. However, because ~~this~~ second clutch is located on the ~~opposite~~ side of the reduced rotation output means ~~via the~~ planetary gear unit, ~~that is to say,~~ the unit with reverse rotation (particularly the ~~linking~~ member) and the unit that ~~takes on~~ the rotation of the input shaft can be ~~configured~~ separated. ~~For example,~~ compared to ~~the case wherein these units are configured with~~ a multiple axis construction ~~and~~ are in contact, decrease in efficiency of the automatic transmission due to relative rotation between these units can be ~~prevented~~.

~~The present invention according to Claim 32 is configured with~~ the first clutch ~~comprising a~~ friction plates ~~of which the~~ inner ~~circumferential side is~~ splined to a member linked to the second rotation component, a first drum ~~member~~ encompassing an oil pressure servo and which is splined ~~to the~~ outer circumferential ~~side of the~~ friction plate, a first piston member for ~~pressing~~ the friction plate, and a first ~~oil pressure~~ servo oil pressure chamber formed by ~~sealing~~ between the inner circumferential ~~side~~ of the

first piston member and the first drum member, ~~so as to be liquid-tight; wherein~~ the second clutch comprises a friction plate ~~of which the~~ having their inner ~~circumferential side is~~ edges splined to a member linked to the third rotation component, a second drum ~~member~~ encompassing an oil pressure servo and which is splined to the outer ~~circumferential side~~ edges of ~~the~~ friction plate, and which is disposed on the inner circumferential side of a member linked to the second rotary component, a second piston member for ~~pressing~~ engaging the friction plate, and a second ~~oil pressure~~ hydraulic servo oil pressure chamber formed by ~~sealing~~ between the inner circumferential ~~side~~ surface of the second piston member and the input shaft, and between the outer circumference ~~side~~ surface and the second drum member, ~~so as to be liquid-tight~~.

~~The present invention according to Claim 33 is configured with~~ the output member may be disposed axially between the first planetary gear unit and the reduced speed rotation output means, ~~in the axial direction~~.

Accordingly, the output unit can be ~~configured~~ located in approximately the axial center ~~in the axial direction~~ of the automatic transmission. ~~For example~~ Thus, when the automatic transmission is mounted on the vehicle, enlarging ment towards ~~one direction of the axis (particularly in the rear direction~~ the end receiving when the input ~~side~~ from the drive source is the front ~~direction) can be prevented~~ becomes unnecessary because the output member

is mounted to ~~match~~ mate with the drive wheel transmission device. Because of this, particularly in the case of ~~an~~ a FF vehicle, ~~the~~ interference ~~toward~~ with the front wheels is reduced, and the mountability on a vehicle ~~can be~~ is improved, ~~such as~~, the steering angle ~~being~~ is greatly increased, for example.

~~The present invention according to Claim 32 is configured with~~ The output member ~~disposed~~ may be located axially between the planetary gear unit and the second clutch, ~~in the axial direction.~~

No. (11) Accordingly, the planetary gear unit and the reduced speed rotation output means can be ~~disposed~~ arranged even closer together, and the ~~linking~~ transmitting member can be further shortened.

~~The present invention according to Claim 34 is configured with~~ The reduced rotation output means may be in the form of ~~comprising~~ a speed reduction second planetary gear unit, more specifically, ~~formed of~~ a double pinion planetary gear unit, wherein the speed reduction second planetary gear unit, the first planetary gear unit, and the output member, are ~~provided~~ arranged coaxially with the input shaft.

~~The present invention according to Claim 35 is configured further comprising~~ A differential unit ~~for~~ outputting rotations to the driving wheels, ~~and~~ a counter shaft unit ~~for~~ is engaging with the differential unit, ~~wherein~~ and the output member ~~is~~ may be a counter gear meshing with the counter shaft unit.

Brief Description of the Drawings

Fig. 1 is a schematic cross-sectional ~~diagram illustrating~~ view of an automatic transmission ~~device of an automatic transmission relating~~ according to a first embodiment; Fig. 2 is an ~~operational~~ operational table of ~~an~~ the automatic transmission ~~relating to~~ of the first embodiment; Fig. 3 is a speed line diagram ~~of an automatic transmission relating to~~ for the first embodiment; Fig. 4 is a schematic cross-sectional ~~diagram illustrating an automatic transmission device~~ view of an automatic transmission ~~relating~~ according to a second embodiment; Fig. 5 is a schematic cross-sectional ~~diagram illustrating an automatic transmission device~~ of an automatic transmission ~~relating~~ according to a third embodiment; Fig. 6 is a table of ~~an operational table~~ of the automatic transmission ~~relating to~~ of the third embodiment; Fig. 7 is a speed line diagram ~~of an~~ for the automatic transmission ~~relating to~~ of the third embodiment; Fig. 8 is a schematic cross-sectional ~~diagram illustrating an automatic transmission device~~ view of an automatic transmission ~~relating~~ according to a fourth embodiment; Fig. 9 is an ~~operational~~ operational table of ~~an~~ for the automatic transmission ~~relating to~~ of the fourth embodiment; ~~and~~ Fig. 10 is a speed line diagram ~~of an~~ for the automatic transmission ~~relating to~~ of the fourth embodiment.

~~Also,~~ Fig. 11 is a schematic cross-sectional ~~diagram illustrating an automatic transmission device~~ view of an automatic transmission ~~relating~~ according to a fifth embodiment; Fig. 12 is a schematic cross-sectional ~~diagram illustrating an~~ view

~~automatic transmission device~~ of an automatic transmission ~~relating to~~ of a sixth embodiment; Fig. 13 is a schematic cross-sectional ~~diagram illustrating an automatic transmission device~~ view of an automatic transmission ~~relating to~~ of a seventh embodiment; Fig. 14 is a schematic cross-sectional ~~diagram illustrating an automatic transmission device~~ view of an automatic transmission ~~relating~~ according to an eighth embodiment; Fig. 15 is a schematic cross-sectional ~~diagram illustrating an automatic transmission device~~ view of an automatic transmission ~~relating~~ according to a ninth embodiment; Fig. 16 is a schematic cross-sectional ~~diagram illustrating an automatic transmission device~~ view of an automatic transmission ~~relating~~ according to a tenth embodiment; Fig. 17 is a schematic cross-sectional ~~diagram illustrating an automatic transmission device~~ view of an automatic transmission ~~relating to~~ of an eleventh embodiment; Fig. 18 is a schematic cross-sectional ~~diagram illustrating an automatic transmission device~~ view of an automatic transmission ~~relating~~ according to a twelfth embodiment; Fig. 19 is a schematic cross-sectional ~~diagram illustrating an automatic transmission device~~ view of an automatic transmission ~~relating~~ according to a thirteenth embodiment; ~~and~~ Fig. 20 is a schematic cross-sectional ~~diagram illustrating an automatic transmission device~~ view of an automatic transmission ~~relating~~ according to a fourteenth embodiment.

~~Also,~~ Fig. 21 is a schematic cross-sectional ~~diagram~~ view

~~illustrating an automatic transmission device~~ of an automatic transmission ~~relating~~ according to a fifteenth embodiment; Fig. 22 is an operational table of ~~an~~ the automatic transmission ~~relating to~~ of the fifteenth embodiment; Fig. 23 is a speed line diagram ~~of an~~ for the automatic transmission ~~relating to~~ of the fifteenth embodiment; Fig. 24 is a schematic cross-sectional ~~diagram illustrating~~ view of an automatic transmission ~~device of an automatic transmission relating~~ according to a sixteenth embodiment; Fig. 25 is an operational table of ~~an~~ the automatic transmission ~~relating to~~ of the sixteenth embodiment; Fig. 26 is a speed line diagram ~~of an~~ for the automatic transmission ~~relating to~~ of the sixteenth embodiment; Fig. 27 is a schematic cross-sectional ~~diagram illustrating an automatic transmission device~~ view of an automatic transmission ~~relating~~ according to a seventeenth embodiment; Fig. 28 is an operational table of ~~an~~ the automatic transmission ~~relating to~~ of the seventeenth embodiment; ~~and~~ Fig. 29 is a speed line diagram ~~of an~~ for the automatic transmission ~~relating to~~ of the seventeenth embodiment;

~~Also,~~ Fig. 30 is a schematic cross-sectional ~~diagram illustrating an automatic transmission device~~ view of an automatic transmission ~~relating~~ according to an eighteenth embodiment; Fig. 31 is an operational table of ~~an~~ the automatic transmission ~~relating to~~ of the eighteenth embodiment; Fig. 32 is a speed line diagram ~~of an~~ for the automatic transmission ~~relating to~~ of the eighteenth embodiment; Fig. 33 is a schematic cross-

sectional ~~diagram illustrating an automatic transmission device~~ view of an automatic transmission ~~relating to~~ of a nineteenth embodiment; Fig. 34 is an operational table of ~~an~~ the automatic transmission ~~relating to~~ of the nineteenth embodiment; Fig. 35 is a speed line diagram ~~of an~~ for the automatic transmission ~~relating to~~ of the nineteenth embodiment; Fig. 36 is a schematic cross-sectional ~~diagram illustrating an automatic transmission device~~ view of an automatic transmission ~~relating~~ according to a twentieth embodiment; Fig. 37 is an operational table of ~~an~~ the automatic transmission ~~relating to~~ of the twentieth embodiment; ~~and~~ Fig. 38 is a speed line diagram ~~of an~~ for the automatic transmission ~~relating to~~ of the twentieth embodiment; ~~Also,~~ Fig. 39 is a schematic cross-sectional ~~diagram illustrating an automatic transmission device~~ view of an automatic transmission ~~relating~~ according to a twenty-first embodiment; Fig. 40 is a schematic cross-sectional ~~diagram illustrating an automatic transmission device~~ view of an automatic transmission ~~relating~~ according to a twenty-second embodiment; Fig. 41 is a schematic cross-sectional ~~diagram illustrating an automatic transmission device~~ view of an automatic transmission ~~relating~~ according to a twenty-third embodiment; Fig. 42 is a schematic cross-sectional ~~diagram illustrating an automatic transmission device~~ view of an automatic transmission ~~relating~~ according to a twenty-fourth embodiment; and Fig. 43 is a schematic cross-sectional ~~diagram illustrating an automatic~~ view

~~transmission device~~ of an automatic transmission ~~relating~~ according to a twenty-fifth embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

~~Best Mode for Carrying Out the Invention~~

~~[~~First Embodiment~~]~~

~~The~~ A first embodiment ~~relating to~~ of the present invention will be described with reference to Fig. 1 through Fig. 3 below. ~~Fig. 1 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the first embodiment, Fig. 2 is an operational table of an automatic transmission relating to the first embodiment, Fig. 3 is a speed line diagram of an automatic transmission relating to the first embodiment.~~

Fig. 1 shows an automatic transmission ~~relating~~ 1, according to the first embodiment ~~according to~~ of the present invention ~~has an automatic transmission device 1, as illustrated in Fig. 1.~~ ~~This~~ that is particularly ~~favorable~~ well suited for an FF (front engine, front wheel drive) vehicle, ~~and has~~ A case ~~comprising a~~ includes a torque converter housing ~~case~~ (not illustrated) and a transmission case 3, which ~~and within this housing case is configured a torque converter, not illustrated, within this transmission case 3 is configured an~~ houses the automatic transmission ~~device~~ 1_1, a counter shaft unit (drive wheel transmission device) (not illustrated) and a differential unit (drive wheel

transmission device).

~~This~~ The torque converter ~~is configured, for example, on the axis that~~ is centered on the axis of an input shaft 2 of the automatic transmission ~~device~~ 1_1, which is on the same axis as the output shaft of the engine (not illustrated), ~~and this automatic transmission device 1_1 is configured on the output shaft of this engine, in other words, the axis that is centered on an input shaft 2.~~ Further, the above-mentioned counter shaft unit ~~is configured on~~ includes a counter shaft (not illustrated) aligned on an axis ~~that is~~ parallel to the input shaft 2, and the above-mentioned differential unit ~~is configured so as to have~~ has a lateral axle ~~not illustrated, on an axis that is~~ aligned parallel to ~~this~~ the counter shaft.

~~Next, an automatic transmission device 1_1 of an automatic transmission relating to the first embodiment will be described, with reference to Fig. 1.~~ As illustrated in Fig. 1, the input shaft 2, ~~has~~ arranged along a first planetary gear unit PU and a second planetary gear unit (reduced rotation output means) PR. ~~This~~ The first planetary gear unit PU is a multiple type planetary gear unit which ~~has~~ includes a sun gear (the second rotation component) S2, a carrier (the third rotation component) CR2, a ring gear (the fourth rotation component) R3, and a sun gear (the first rotation component) S3, as the four rotation components, ~~wherein~~ The carrier CR2 has a long pinion PL that meshes with ~~the~~ sun gear S3 and ~~a~~ the ring gear R3, and a short pinion PS

that meshes with a sun gear S2, which are meshed to one another. Further, the above mentioned planetary gear PR is a so-called double planetary gear that has a carrier CR1, wherein a pinion Pb meshes with a ring gear R1 and a pinion Pa meshes with a sun gear S1, which mesh one with another.

On the above mentioned input shaft 2 is configured a multi-disc clutch (first clutch) C1, which comprises an oil pressure servo 11, a friction plate 71, a drum shaped member 21 that forms a clutch drum, and a hub unit 22 liked to a sun gear S2 on the inner circumference side; and a multi-disc clutch (third clutch) C3, which has an oil pressure servo 13, a friction plate 73, a drum shaped member 25 that forms a clutch drum on the outer circumference side. Further, on the outer circumference side of the drum shaped member 25 is configured a multi-disc brake B1 (first brake) which has an oil pressure servo 14 and a friction plate 74.

This oil pressure servo 11 is constructed from a piston unit b for pressurizing the friction plate 71, a drum shaped member 21 that has a cylinder unit e, an oil pressure servo oil chamber (hereafter, simply "oil chamber") "a" which is formed by sealing between this piston unit b and this cylinder unit e with seal rings f and g, a return spring c that presses this piston unit b toward this oil chamber "a", and a return plate d that absorbs the energy of this return spring c.

~~Now, for~~ In the ~~following~~ descriptions to follow, each ~~oil pressure~~ hydraulic servo shall be considered as being constructed similarly, i.e. ~~from~~ as having an oil chamber "a", a piston unit b, a return spring c, a return plate d, a cylinder unit e, and seal rings f and g, and, as such, ~~these~~ descriptions thereof will not be ~~given~~ repeated.

The oil chamber "a" of this ~~oil pressure~~ hydraulic servo 11 is connected to an oil line 2a which is formed on the ~~above-mentioned~~ input shaft 2, and this oil line 2a ~~is provided along one edge of the case 3, and~~ is connected to the oil line 91 of the boss ~~unit~~ 3a which is in the form of a sleeve surrounding ~~provided on~~ the input shaft 2, ~~in a sleeve form~~. Further, this oil line 91 is connected to an oil pressure control unit, not illustrated. In other words, due to the above-mentioned ~~oil pressure~~ hydraulic servo 11 being ~~configured~~ mounted on the input shaft 2, an oil ~~line~~ supply path from the oil pressure control unit, not illustrated, to the oil chamber "a" of the ~~oil pressure~~ hydraulic servo 11 is ~~configured,~~ connected simply by providing one set of seal rings 81 ~~to seal~~ between the boss ~~unit~~ 3a ~~of the case 3~~ and the input shaft 2.

Further, the oil chamber "a" of the above-mentioned ~~oil~~ hydraulic ~~pressure~~ servo 13 is directly connected to an oil line 92 of the above-mentioned boss ~~unit~~ 3a, and this oil line 92 is connected to an oil pressure control unit, not illustrated. ~~In other words, for the above-mentioned oil pressure~~ Thus, the hydraulic servo 13 ~~, an oil line from the oil pressure control unit, not illustrated, to the~~ has its oil chamber "a" connected to the oil pressure ~~of the oil pressure~~

control unit
~~servo 13 is configured,~~ simply by providing one set of seal rings 80 ~~to seal~~ between the boss ~~unit~~ 3a ~~of the case 5~~ and the drum ~~shaped member~~ 25.

The ~~above-mentioned~~ input shaft 2 is connected to the above-mentioned drum ~~shaped member~~ 21, and ~~on~~ the inner circumferen~~ce side~~ tial surface of this drum ~~shaped~~ member 21 is ~~configured in a~~ splined ~~manner~~ to the friction plate 71 of the clutch C1 which is ~~capable of engaging due to the oil pressure~~ operated by the hydraulic servo 11. ~~for the clutch C1, and is connected wherein~~ The ~~inner circumference side of the~~ friction plate 71 of ~~this~~ clutch C1 ~~is~~ are intermeshed with friction plates splined to the hub unit 22. ~~Further,~~ ~~this hub unit 22~~ which is connected to the ~~above-mentioned~~ sun gear S2.

~~Further,~~ The ~~above-mentioned~~ drum ~~shaped member~~ 25 is rotatably supported by the ~~above-mentioned~~ boss ~~unit~~ 3a ~~so as to rotate,~~ and ~~on~~ the outer circumferen~~ce side~~ tial surface of the a front portion ~~edge~~ of this drum ~~shaped member~~ 25 is splined to ~~the~~ friction plate 74 of the brake B1 which can be ~~retained~~ engaged by the ~~oil pressure~~ hydraulic servo 14 ~~for the above-mentioned brake B1. On~~ The inner circumferen~~ce side~~ tial surface of the front ~~edge~~ portion of this drum ~~shaped member~~ 25 is ~~configured~~ splined to the friction plate 73 of the clutch C3 which is ~~capable of engaging~~ operated by the ~~oil pressure~~ hydraulic servo 13. ~~for the clutch C3, splined, and on the inner circumference side of the~~ The friction plate 73 ~~of this clutch~~ are intermeshed with friction plates splined to ~~C3~~ the ring gear R1. ~~is splined.~~

~~Further,~~ The carrier CR1 supports ~~has~~ a pinion Pa and a pinion Pb, ~~and this~~ pinion Pb meshes with the above-mentioned ring gear R1, and ~~this~~ pinion Pa meshes with the sun gear S1 which is ~~is~~ connected to the input shaft 2. This carrier CR1 is secured to the boss ~~unit~~ 3a ~~of the case 3~~ via a side plate, and ~~this~~ ring gear R1 is supported by a supporting plate ~~unit~~ 26 which, in turn, is rotatably supported by ~~to~~ the boss ~~unit~~ 3a, ~~so as to rotate.~~

Further, ~~to~~ the above-mentioned drum-shaped ~~member~~ 25 receives, viz ~~is connected~~ a linking member (hereafter, also referred to as "transmitting member") 30, ~~that transmits~~ the rotation of the ring gear R1, ~~when the clutch C3 is engaged, and further, to the other side~~ At one end of this transmitting member 30 is connected the sun gear S3 of the ~~above-mentioned~~ first planetary gear unit PU.

~~On the other hand,~~ On the other side of the input shaft 2 (left in diagram) is ~~configured~~ a multi-disc clutch (second clutch) C2 that has an oil pressure servo 12, a friction plates 72, a ~~drum-shaped member 23 that forms a~~ clutch drum 23, and a hub unit 24 linked to a carrier CR2.

~~The~~ Oil chamber "a" of ~~this oil pressure~~ hydraulic servo 12 is connected to an oil line 2b which is formed on the above-mentioned input shaft 2, and this oil line 2b ~~is provided along the edge of the case 3 that is the opposite side of that of the above-mentioned boss unit 3a, and~~ is connected to the oil line 93 in the boss ~~unit~~ 3b which is also formed as sleeve ~~provided on~~

around
the input shaft 2, ~~in a sleeve form. Further,~~ this oil line 93 is connected to an oil pressure control unit, not illustrated. ~~In other words~~, Thus, an oil line from the oil pressure control unit, ~~not illustrated,~~ is connected to the oil chamber "a" of the oil pressure servo 12 ~~is configured,~~ simply by providing one set of seal rings 82 ~~to seal~~ between the input shaft 2 and the drum ~~shaped member~~ 23.

~~Further, to the above-mentioned input shaft 2, within the left side of the diagram, a drum-shaped member 23 is connected, and on~~ the inner circumferential surface ~~side~~ of ~~the~~ a front ~~edge~~ portion of ~~this~~ drum ~~shaped member~~ 23 is splined to the friction plates 72 of the clutch C2 which is ~~capable of engaging~~ operated by the ~~oil pressure~~ hydraulic servo 12. ~~for the clutch C2.~~ The ~~inner circumference side of the~~ friction plates 72 of this clutch C2 ~~is~~ are intermeshed with friction plates splined to the hub unit 24, and this hub unit 24 is connected to the side plate of the ~~above-mentioned~~ carrier CR2.

~~On the other hand, on the outer circumference side~~ Radially outward of the planetary gear unit PU is ~~configured~~ a multi-disc brake (second brake) B2 that has an oil pressure servo 15, ~~a~~ friction plates 75, and a hub unit 28. ~~So~~ The side plate of the carrier CR2 of this planetary gear unit PU is connected to a hub unit 28 to which ~~is~~ are splined the friction plates 75 of the above-mentioned brake B2, ~~and further,~~ this hub unit 28 is also connected to the inner race of a one-way clutch F1.

~~Further,~~ The ~~above-mentioned~~ ring gear R3 meshes with the long pinion PL of ~~this~~ carrier CR2, has one end connected to a linking member 27 ~~is connected to one edge of this ring gear R3~~, and ~~this ring gear R3~~ is linked to the counter gear 5 via this linking member 27.

As described above, the second unit planetary gear PR and the clutch C1 clutch C3 are located at ~~configured on~~ one ~~side in the~~ axial ~~direction~~ end of the first planetary gear unit PU, and ~~also~~ the clutch ~~C1~~ C2 is ~~configured~~ located on the opposite axial ~~one~~ side, ~~in the axial direction, and the clutch C2 is configured on the other side in the axial direction, and~~ the counter gear 5 is ~~configured in~~ located between the second unit planetary gear PR and the first planetary gear unit PU. Further, the clutch C1 is disposed ~~on the inner~~ radially inward ~~circumferential side~~ of the clutch C3, and particularly inward of a section of the transmitting member 30 that transmits the output thereof. Further, the brake B1 is ~~configured on the outer circumference side~~ located radially outward of the second unit planetary gear PR, and the brake B2 is ~~configured on the outer circumference side~~ located radially outward of the first planetary gear unit PU.

~~Continuing, based on the above-mentioned construction,~~ ~~the~~ Operations of ~~an~~ automatic transmission ~~device~~ 1_1 will now be described, with reference to Fig. 1, Fig. 2, and Fig. 3 below. ~~Now,~~ The vertical axis of the speed line diagram illustrated in Fig. 3 indicate the ~~revolutions~~ rotational speeds of each ~~rotation~~ component, and the horizontal axis indicates the

corresponding gear ratio ~~of~~ for these rotation components. ~~Further, regarding~~ In the planetary gear unit PU section of this speed line diagram, the vertical axis to the farthest ~~horizontal edge (the~~ right side of Fig. 3) corresponds to sun gear S3, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the vertical ~~axis~~ axes corresponds to the carrier CR2, the ring gear R3, and the sun gear S2. Further, ~~regarding~~ in the planetary gear PR section of this speed line diagram, the vertical axis to the farthest ~~horizontal edge (the~~ right side of Fig. 3) corresponds to sun gear S1, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the vertical ~~axis~~ axes corresponds to the ring gear R1 and the carrier CR1. Further, the widths between these vertical axes are inversely proportional to the ~~inverse of the~~ number of teeth of each of the sun gears S1, S2, S3, and to the ~~inverse of the~~ number of teeth of each of the ring gears R1, R3. ~~Also,~~ The dotted line ~~in the~~ horizontal ~~direction~~ within the diagram ~~illustrates that~~ represents the rotation ~~is~~ transmitted ~~from~~ by the transmitting member 30.

As illustrated in Fig. 1, the rotation of input shaft 2 is input to the ~~above mentioned~~ sun gear S2, by engaging the clutch C1. The rotation of input shaft 2 is input to the above-mentioned carrier CR2, by engaging the clutch C2, and this carrier CR2 can be fixed against rotation by ~~the~~ engagement of ~~retaining~~ brake B2, ~~and~~ further, the rotation is limited to one direction ~~is~~

~~regulated~~ by the one-way clutch F1. ~~Further,~~ The sun gear S3 can be fixed against rotation by engagement of the ~~the retaining~~ of the brake B1.

~~On the other hand,~~ The above-mentioned sun gear S1 is connected to the input shaft 2 so as to receive as input ~~and~~ the rotation thereof. ~~of this input shaft 2 is input, and further,~~ The carrier CR1 is fixed ~~connected~~ to the case 3 ~~and its rotation is fixed,~~ and, therefore, the ring gear R1 rotates at reduced speed ~~rotations~~. Further, by engaging the clutch C3, the reduced speed rotation of this ring gear R1 is input to the sun gear S3.

Also, the rotation of the ~~above-mentioned~~ ring gear R3 is output to the ~~above-mentioned~~ counter gear 5, and is output to the drive wheels via this counter gear 5, a counter shaft unit not illustrated, and a differential unit.

At first speed forward within D (drive) range, as illustrated in Fig. 2, the clutch C1 and the one-way clutch F1 are engaged. Then, as illustrated in Fig. 3, the rotation of input shaft 2 is input to the sun gear S2 via the clutch C1, and the rotation of the carrier CR2 is limited to ~~regulated in~~ one direction (the forward rotation direction). ~~In other words, the carrier CR2 is prevented from rotating in the opposite direction and becomes fixed.~~ Further, the rotation of input shaft 2 that is input to the sun gear S2 is output to the ring gear R3 via the fixed carrier CR2, and the forward rotation for first speed forward is output from the counter gear 5. ~~Now,~~ When downshifting (~~when~~ coasting),

the brake B2 is ~~retained~~ engaged and carrier CR2 is fixed, thereby and the above-~~mentioned~~ described state of first speed forward is maintained while preventing the forward rotation of ~~this~~ carrier CR2. ~~Further, at~~ In this first speed forward, because the one-way clutch F1 ~~prevents~~ of the carrier CR2 ~~from rotation in the opposite direction and~~ allows only forward rotation, ~~and therefore,~~ switching from a non-driving range to a driving range and achieving the first speed forward can be accomplished more smoothly by the automatic engaging of the one-way clutch.

~~At~~ In second speed forward within the D (drive) range, as illustrated in Fig. 2, the clutch C1 ~~is engaged~~ and the brake B1 ~~is retained~~ are engaged. Then, as illustrated in Fig. 3, the rotation of input shaft 2 is input to the sun gear S2 via the clutch C1, and the sun gear S3 is fixed by ~~retaining~~ engagement of the brake B1. By doing so, the carrier CR2 rotates at a slightly reduced ~~rotation~~ speed, and the rotation of input shaft 2 that was input in the sun gear S2 is output to the ring gear R3 via the carrier CR2 at this reduced ~~rotation.~~ speed, and the forward rotation for second speed forward is output from the counter gear 5.

~~At~~ In third speed forward within the D (drive) range, as illustrated in Fig. 2, the clutch C1 and the clutch C3 are engaged. Then, as illustrated in Fig. 3, the rotation of input shaft 2 is input to the sun gear S2 via the clutch C1. Further, by the input of the rotation of the input shaft 2 ~~input~~ to the

sun gear S1 and the fixed carrier CR1, the ring gear R1 is rotated at a reduced ~~rotation~~ speed, and the ~~speed~~ reduced speed rotation of ~~this~~ ring gear R1 is output to the sun gear S3 via the clutch C3 and the transmitting member 30. ~~Then,~~ the carrier CR2 rotates at a speed slightly ~~greater~~ reduced ~~rotation~~ compared to ~~the reduced rotation of this~~ sun gear S3 because of the rotation of the input shaft 2 input to the sun gear S2 and the reduced ~~rotation~~ speed of the sun gear S3. Further, the rotation of input shaft 2 that ~~was~~ is input ~~in~~ To the sun gear S2 is output to the ring gear R3 via the carrier CR2 at this reduced ~~rotation~~ speed, and the forward rotation for third speed forward is output from the counter gear 5. In this case, because the sun gear S3 and the ring gear R1 are rotating at a reduced ~~rotation~~ speed, the above-mentioned transmitting member 30 ~~performs~~ transmits a relatively large torque ~~transmission.~~

~~At~~ In fourth speed forward within the D (drive) range, as illustrated in Fig. 2, the clutch C1 and the clutch C2 are engaged. Then, as illustrated in Fig. 3, the rotation of input shaft 2 is input to the sun gear S2 via the clutch C1, and into the carrier CR2 via the clutch C2. Therefore, by input of the rotation of the input shaft 2 ~~input~~ to the sun gear S2 and the rotation of input ~~shat~~ shaft 2 input to the carrier CR2, ~~in other words, in the~~ a state of directly coupled rotation is established wherein the rotation of the input shaft 2 is output as is ~~to~~ to the ring gear R3, and the forward rotation for fourth speed

forward is output from the counter gear 5.

In ~~At~~ fifth speed forward within the D (drive) range, as illustrated in Fig. 2, the clutch C2 and the clutch C3 are engaged. Then, as illustrated in Fig. 3, the rotation of input shaft 2 is input to the carrier CR2 via the clutch C2. Further, by input of the rotation of the input shaft 2 ~~input~~ to the sun gear S1 and the fixed state of carrier CR1, the ring gear R1 rotates at a reduced ~~rotation~~ speed, and the ~~speed~~ reduction speed rotation of this ring gear R1 is output to the sun gear S3 via the clutch C3 and the above-mentioned transmitting member 30. ~~Then, the~~ Overdrive rotation is output to the ring gear R3 from the ~~reduced rotation of the~~ sun gear S3 and the carrier CR2 ~~wherein the rotation of the input shaft 2 is input~~, and the forward rotation for fifth speed forward is output from the counter gear 5. In this case, similar to the case of ~~the~~ above-mentioned third speed forward, due to rotation of the sun gear S3 and the ring gear R1 ~~being~~ at a reduced speed ~~rotation~~, the above-mentioned transmitting member 30 transmits ~~performs~~ a relatively large torque ~~transmission.~~

In ~~At~~ sixth speed forward within the D (drive) range, as illustrated in Fig. 2, the clutch C2 ~~is engaged~~ and the brake B1 are engaged ~~is retained~~. Then, as illustrated in Fig. 3, the rotation of the input shaft 2 is input to the carrier CR2 via the clutch C2, and the sun gear S3 is fixed by engagement of ~~retaining~~ the brake B2. This produces ~~causes an~~ overdrive rotation ~~(even~~

(greater than that of the above-mentioned fifth speed forward), from the rotation of the input shaft 2 input to the carrier CR2 and the fixed sun gear S3, ~~and~~ is output to the ring gear R3, and the forward rotation for sixth speed forward is output from the counter gear 5.

~~At the~~ first speed reverse within an R (reverse) range, as illustrated in Fig. 2, the clutch C3 ~~is engaged~~ and the brake B2 ~~is retained~~. Then, as illustrated in Fig. 3, the ring gear R1 rotates at reduced ~~rotations from~~ the rotation of input shaft 2 input to the sun gear S1 and the fixed carrier CR1, and the reduced ~~rotation~~ of this ring gear R1 ~~this reduced rotation~~ is output to the sun gear S3 via the clutch C3 and the above-mentioned transmitting member 30. Further, the carrier CR2 is fixed by ~~retaining~~ the brake B2. Then, the reduced rotation of the sun gear S3, ~~and the fixed~~ carrier CR2 is output to the ring gear R3 as ~~an opposite direction rotation, and the opposite direction~~ rotation ~~for~~ first speed reverse ~~is output~~ from the counter gear 5. In this case, similar to the case of the above-mentioned third speed forward or fifth speed forward, since the sun gear S3 and the ring gear R1 are at a reduced ~~rotation~~, the above-mentioned transmitting member 30 ~~performs~~ a relatively large torque ~~transmission~~.

~~At~~ the P (parking) range and the N (neutral) range, ~~particularly~~ clutch C1, clutch C2, and clutch C3 are

released, the ~~transmission movement between the~~ input shaft 2 ~~and~~ the counter gear 5 is disconnected from, and the automatic transmission ~~device~~ 1_1 as a whole is in an idle state (neutral state).

As described above, ~~according to~~ in the automatic transmission device 1_1 ~~relating to~~ of the present invention, due to the location of the planetary gear unit PR and the clutch C1 ~~being configured~~ second on one side ~~in the~~ axial ~~direction~~ of the first planetary gear unit PU, and the clutch C2 being ~~configured~~ located on the other side ~~in the~~ axial ~~direction~~ of the planetary gear unit PU, the second planetary gear unit PR and the first planetary gear unit PU can be ~~configured~~ arranged more closely together, as compared to the case wherein for example two clutches C1 and C2 are ~~configured in~~ located between the second planetary gear unit PR and the first planetary gear unit PU, and the transmitting member 30 for transmitting reduced speed rotation can be relatively shorte~~ned~~r. ~~By doing so~~, In this manner the automatic transmission can be made more compact and ~~more~~ lightweight. Further, because the inertia (force ~~of~~ inertia) can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced. Further, compared to the case wherein three clutches C1, C2, C3 are ~~configured~~ located on one side of the first planetary gear unit PU, the oil lines (for example, 2a, 2b, 91, 92, 93) that supply the ~~oil pressure~~ hydraulic servos 11, 12, and 13 of these clutches C1, C2,

C3, ~~can be~~ are constructed more easily, ~~and~~ the manufacturing process ~~can be~~ is simplified and the costs ~~brought down~~ is reduced.

Further, due to the oil pressure servos 11 and 12 being provided on the input shaft 2, one set of seal rings 81 and 82 ~~seal the case 3 and supply oil to~~ serves to form a connection with the oil lines 2a and 2b provided within input shaft 2, and therefore oil can be supplied to the oil chamber "a" of the ~~oil pressure~~ hydraulic servos 11 and 12 without providing seal rings between, for example, the input shaft 2 and the ~~oil~~ hydraulic pressure servos 11 and 12. Further, the ~~oil pressure~~ hydraulic servo 13 can receive ~~supply~~ oil directly from the boss ~~unit~~ 3a ~~provided from the case 3,~~ i.e. without passing through other units, ~~for example, in other words, can supply~~ merely ~~oil~~ by providing one set of seal rings 80. Therefore, ~~oil~~ the hydraulic servos can be ~~supplied~~ connected to the oil supply simply by providing one set of seal rings 81 and 82, 80 each for each of the oil pressure servos 11, 12, and 13, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, since the clutch C1 is ~~configured on the inner circumference side~~ located radially inward of the clutch C3, the clutch C3, which must transmit a relatively large torque in order to transmit the reduced speed rotation, can be ~~configured on~~ located at the outer ~~circumference~~ side, and therefore this clutch C3 ~~and the oil pressure~~ its hydraulic servo operator 13 ~~thereof~~ can have an increased diameter. ~~Particularly~~ Thus, the pressure receiving area of the oil chamber "a" of the

~~oil pressure~~ hydraulic servo 13 can be enlarged, and the ~~capacity~~ capacity ~~capable of~~ torque transmission of this clutch C3 can be increased. By ~~configuring~~ designing the clutch C1 ~~which can~~ to have a smaller ~~capacity for~~ capacity as torque transmission compared to the clutch C3, the automatic transmission can be made more compact.

Further, because the counter gear 5 is ~~configured in the~~ located first axially ~~direction~~ between the planetary gear unit PU and, the second planetary gear unit PR, the counter gear 5 can be ~~configured~~ located in approximately the center ~~in the~~ axial ~~direction~~ of the automatic transmission. Thus, for example, when the automatic transmission is mounted on the vehicle, enlarging ~~towards one direction of the axis (particularly in the rear direction~~ exert which receives input when the ~~input~~ side from the drive source is the front ~~direction)~~ is not necessary ~~can be prevented~~ because the counter gear 5 is mounted to ~~match~~ mate with the drive wheel transmission device. Because of this, particularly in the case of an FF vehicle, ~~the~~ interference ~~toward~~ with the front wheels is reduced, and the ~~mountability on a vehicle can be improved, such as the~~ steering angle can being greatly increased, for example.

~~Further,~~ The automatic transmission ~~device~~ 1_1 ~~according to~~ of the ~~present~~ first embodiment is ~~a transmission device that is~~ directly coupled ~~at~~ in fourth speed forward. Therefore, at fifth speed forward and sixth speed forward, the gear ratio can be ~~specified to~~ a high or ratio, and, ~~particularly~~ when

~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine ~~revolutions~~ speed can be relatively lowered, ~~and this contributes to the quietness of~~ which allows the vehicle ~~while~~ to run more quietly at a high speed.

~~Second Embodiment~~

A second embodiment, which is a partial modification of the first embodiment, will now be described, with reference to Fig. 4 ~~Fig. 4 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the second embodiment~~ which shows.

~~Now,~~ Components of the second embodiment that are the same as those of the first embodiment ~~will be~~ are denoted by the same reference numerals, and description thereof omitted, except for those components partially modified.

~~As Fig. 4 illustrates, the~~ An automatic transmission device 1_2 ~~of the automatic transmission relating to the second embodiment has the~~ as having its input ~~side~~ and output sides reversed ~~backwards~~ from ~~that of~~ the automatic transmission ~~device~~ 1_1 ~~of the automatic transmission~~ of the first embodiment. Further, the ~~actions of~~ operations of the first ~~speed forward~~ through ~~the~~ sixth ~~speed~~s forward and the first speed reverse ~~is similar~~ of I_2 of the second embodiment are similar to those of the automatic transmission I_1 of the first embodiment (see Fig. 2 and Fig. 3).

~~Similar to~~ As with the first embodiment, ~~according to the automatic transmission device 1_2 relating to the present invention~~ in this second embodiment, due to the planetary gear PR and the clutch C1

being ~~configured~~ located on one side ~~in the axial direction~~ of the first planetary gear unit PU, and the clutch C2 being ~~configured~~ located on the other axial side ~~in the axial direction~~ of the planetary gear unit PU, the second planetary gear unit PR and the first planetary gear unit PU can be ~~configured~~ placed more closely together, as compared to the case wherein, for example, the two clutches C1 and C2 are ~~configured in~~ located between the second planetary gear unit PR and the first planetary gear unit PU. ~~so~~ Thus, the transmitting member 30 ~~for~~ which transmit~~ting~~s the reduced speed rotation can be relatively shorte~~ned~~r. By doing so, the automatic transmission can be made more compact and more lightweight. Further, because the inertia (~~of inertia~~) (inertial force) can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced. Further, compared to the case where the three clutches C1, C2, C3 are ~~configured~~ located on one side of the first planetary gear unit PU, the oil lines (for example, 2a, 2b, 91, 92, 93) that supply the ~~oil pressure~~ hydraulic servos 11, 12, and 13 of these clutches C1, C2, C3 can be more constructed easily, ~~and~~ the manufacturing process can be simplified and the costs brought down.

Further, since the ~~oil pressure~~ hydraulic servos 11 and 12 are ~~provided~~ mounted on the input shaft 2, one set of seal rings 81 and 82 serves to seal the case 3 and ~~supply oil to~~ to establish a connection with the oil lines 2a and 2b ~~provided~~ within input shaft 2, and therefore oil can be supplied to the oil chamber 3 "a" of the ~~oil pressure~~ hydraulic servos

11 and 12 without providing seal rings between, for example, the input shaft 2 and the ~~oil pressure~~ hydraulic servos 11 and 12. Further, ~~oil pressure~~ hydraulic servo 13 can receive supply of oil directly from the boss unit 3a ~~provided from the case 9~~, i.e. without passing through that supply other units, for example, ~~in other words, can supply oil~~ by providing sion of one set of seal rings 80. Therefore, oil supply can be ~~supplied simply~~ connected by providing sion of one set of seal rings 81 and 82, respectively, 80 each for the ~~oil pressure~~ hydraulic servos 11, 12, and 13, ~~and~~ sliding resistance from the seal rings can be minimized, and accordingly, the efficiency of the automatic transmission can be improved.

As in the first embodiment ~~Further~~, ~~due to~~ because the clutch C1 ~~being configured on the inner circumference side~~ is located radially inward of the clutch C3, the clutch C3, which must transmit a relatively large torque in order to transmit the reduced speed rotation, can be ~~configured on~~ arranged at the outer circumference, ~~which, and~~ Therefore, this clutch C3 and ~~the oil~~ its pressure servo 13 ~~thereof~~ can have an increased diameter, ~~Particularly,~~ the pressure receiving area of ~~the~~ its oil chamber ~~of the oil pressure servo 13~~ can be enlarged, and ~~the capacity capable of~~ its torque transmission capacity ~~of this clutch C3~~ can be increased. Again, by ~~configuring~~ designing the clutch C1 ~~which can~~ to have a smaller capacity ~~for~~ as torque transmission compared to the clutch C3, the automatic transmission can be made more compact.

Further, because the counter gear 5 is ~~configured in~~ located

~~the~~ axial ~~direction~~ between the first planetary gear unit PU and the second planetary gear unit PR, the counter gear 5 can be ~~configured~~ located in approximately the axial center ~~in the axial direction~~ of the automatic transmission. With this second embodiment also ~~For example, when the automatic transmission is mounted on the vehicle,~~ enlargement towards ~~one direction of the axis (particularly in~~ the rear ~~direction~~ end which receives when the input ~~side~~ from the drive source is the front ~~direction~~) ~~can be prevented~~ is not necessary because the counter gear 5 is mounted to ~~match~~ mate with the drive wheel transmission device. Because of this, particularly in the case of an FF vehicle, ~~the~~ interference ~~toward~~ with the front wheels is reduced, ~~and the~~ mountability on a vehicle ~~can be~~ is improved, ~~such as~~ and the steering angle ~~being~~ is greatly increased~~, for example~~.

Further, the automatic transmission ~~device~~ ~~1-2~~ 1_2 according to the ~~present~~ second embodiment ~~is a transmission device that~~ is directly coupled ~~at~~ in fourth speed forward. Therefore, at fifth speed forward and sixth speed forward, the gear ratio can be ~~specified to~~ a high ratio, and ~~particularly when mounted on a vehicle, in the event that~~ when the vehicle is running at a high speed, the engine ~~revolutions~~ speed can be relatively less ~~lowered~~, ~~and this contributes to the quietness of the~~ Thus allowing the vehicle ~~while~~ to run more quietly at a high speed.

~~Third Embodiment~~

A third embodiment, which is a partially modification of ~~modified from~~ the first embodiment, will now be described with reference to Fig. 5

through Fig. 7. ~~Fig. 5 is a schematic cross-sectional~~ diagram illustrating the automatic transmission device of an automatic transmission relating to the third embodiment, Fig. 6 is an operational table of an automatic transmission relating to the third embodiment, and Fig. 7 is a speed line diagram of an ~~automatic transmission relating to the third embodiment.~~ Now, components of the third embodiment that are the same as the first embodiment ~~will be~~ are denoted ~~with~~ by the same reference numerals, and description thereof omitted, except for those components partially modified.

As ~~Fig. 5 illustrates,~~ shown in Fig. 5, the automatic transmission ~~device~~ 1_3 of the ~~automatic transmission relating to the~~ third embodiment is ~~a modification of~~ modified with respect to the configuration of the second planetary gear unit PR and the clutch C3, ~~from that of the~~ as compared to the automatic transmission ~~device~~ 1_1 of the automatic transmission of the first embodiment (see Fig. 1).

The clutch C3 is ~~configured~~ located on the planetary gear unit PU side (left side of diagram) of the second planetary gear unit PR, ~~within~~ this automatic transmission device 1_3. The inner circumference ~~side~~ flat surface of ~~the~~ a front ~~edge~~ portion of the drum ~~shaped member~~ 25 of ~~this~~ clutch C3 is splined to the friction plates 73, ~~and the inner circumference side of this~~ which are intermeshed with friction plates 73 ~~is~~ splined to the hub unit 26. Further, the drum ~~shaped member~~ 25 is connected to the input shaft 2, and the hub unit 26 is connected to the sun gear S1.

3rd Embod Fig 5

~~Further,~~ The side plate of the carrier CR1 is fixed to and supported by the case 3. Also, the ring gear R1 is connected to the transmitting member 30, and the outer circumferential surface of the transmitting member 30 is splined to the friction plates 74 of the brake B1, and this transmitting member 30 is connected to the sun gear S3.

The oil chamber of ~~this oil pressure~~ hydraulic servo 13 for the clutch C3 is connected to an oil line 2c which is formed ~~with a double structure~~ in parallel with oil line 2a on the ~~above-mentioned~~ input shaft 2, and this oil line 2c is connected to the oil line 92 of the boss ~~unit~~ 3a ~~of the case 3.~~ ~~Further, this oil line 92~~ which, in turn, is connected to an oil pressure control unit, not illustrated. In other words, ~~due to the above-mentioned oil pressure~~ because the hydraulic servos 11 and 13 ~~servo 13 being configured~~ are mounted on input shaft 2, ~~an~~ oil ~~line~~ supply from the oil pressure control unit, not illustrated, to the oil chambers ~~of the oil pressure servo 11 and the oil pressure servo 13 is configured,~~ can be connected simply by providing seal rings 81 ~~to seal~~ between the boss ~~unit~~ 3a of ~~the case 3~~ and the input shaft 2.

~~Continuing, based on the above-described construction~~ of the third embodiment the operations of the automatic transmission ~~device~~ 1_3 will now be described below, with reference to Fig. 5, Fig. 6, and Fig. 7. ~~Now,~~ similar to the ~~above~~ first embodiment, the vertical axes of the speed line diagram ~~illustrated~~ in Fig.

7 indicate the ~~revolutions~~ speed of each rotation component, and the horizontal axis indicates the corresponding gear ratio of these rotation components. ~~Further, regarding~~ In the planetary gear unit PU section of this speed line diagram, the vertical axis to the farthest ~~horizontal edge (the~~ right side of Fig. 7 corresponds to the sun gear S3, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the vertical ~~axis~~ axes corresponds to the carrier CR2, the ring gear R3, and the sun gear S2. ~~Further, regarding~~ In the planetary gear unit PR section of this speed line diagram, the vertical axis to the farthest ~~horizontal edge (the~~ right side of Fig. 7 corresponds to the sun gear S1, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the vertical ~~axis~~ axes corresponds to the ring gear R1 and the carrier CR1. Further, the width s between these vertical axes are inversely proportional to the ~~inverse of the~~ number of teeth of each of the sun gears S1, S2, S3, and to the ~~inverse of the~~ number of teeth of each of the ring gears R1, R3. Also, the dotted line ~~in the~~ horizontal ~~direction~~ in the diagram ~~illustrate that~~ represents the rotation is transmitted ~~from~~ by the transmitting member 30.

As Fig. 5 illustrates, the rotation of input shaft 2 is input to the ~~above-mentioned~~ sun gear S1 by engaging the clutch C3. Further, the ~~rotation of the above-mentioned~~ carrier CR1 is fixed as to the case 3, and the ~~above~~

~~mentioned~~ ring gear R1 rotates at a reduced ~~rotations~~ speed based on the rotation of input shaft 2 which is input to ~~this~~ sun gear S1. In other words, by engaging the clutch C3 the reduced speed rotation of the ring gear R1 is input to the sun gear S3 via the transmitting member 30.

~~By doing so~~, In this manner, as illustrated in Fig. 6 and Fig. 7 ~~illustrate~~, regarding the second planetary gear unit PR, ~~at~~ in third speed forward, fifth speed forward, and first speed reverse, the rotation of the input shaft 2 is input to the sun gear S1 by engaging the clutch C3, and the reduced speed rotation is output to the ring gear R3 ~~by~~ through the fixed carrier CR1, ~~and the reduced rotation is input~~ to the sun gear S3 via the transmitting member 30. In this case, because the ring gear R1 and the sun gear S3 are rotating at a reduced speed, ~~therefore the above mentioned~~ the transmitting member 30 ~~performs~~ transmits a relatively large torque, ~~transmission.~~ On the other hand, ~~at~~ in first speed forward, second speed forward, fourth speed forward, and sixth speed forward, the rotation of the sun gear S3 is input to the ring gear R1 via the transmitting member 30, and further, because the clutch C3 is released, as Fig. 7 illustrates, the sun gear S1 rotates based on ~~each~~ the rotation ~~within the speed level~~ of ~~this~~ ring gear R1 and the fixed carrier CR1.

~~Now, the actions~~ The operations other than those described above for ~~of~~ the ~~above-~~ ~~mentioned~~ second planetary gear unit PR are similar to those ~~of the~~ previously ~~above~~ described for the first embodiment (see Fig. 2 and Fig. 3),

and accordingly description thereof will be omitted.

As described above, ~~according to~~ the automatic transmission ~~device~~ 1_3 ~~relating to the present invention~~, due to the planetary gear PR and the clutch C1 being ~~configured~~ on one side ~~in the axial direction~~ of the planetary gear unit PU, and the clutch C2 being ~~configured~~ on the other side ~~in the axial direction~~ of the planetary gear unit PU, the planetary gear PR and the planetary gear unit PU can be ~~configured~~ closely together, compared to the case wherein, for example, two clutches C1 and C2 are ~~configured in~~ between the planetary gear PR and planetary gear unit PU, and the transmitting member 30 ~~for transmitting reduced rotation~~ can be relatively shortened. ~~By doing so~~, the automatic transmission can be made more compact and more lightweight. Further, because the inertia (force ~~of~~ inertia) ~~can be~~ reduced, the controllability of the automatic transmission ~~can be~~ increased, and the occurrence of speed change shock can be reduced. Further, compared to the case wherein three clutches C1, C2, C3 are ~~configured~~ on one side of the planetary gear unit PU, the oil lines (for example, 2a, 2b, 91, 92, 93) that supply the ~~oil pressure~~ servos 11, 12, and 13 of these clutches C1, C2, C3 can be constructed easily, ~~and~~ the manufacturing process can be simplified and the costs ~~brought down~~.

Further, due to the oil pressure servos 11, 12, and 13

~~are provided~~ on the input shaft 2, the seal rings 81 and 82 can seal the ~~case 3 and supply oil to~~ bosses 3a and 3b to the input shaft 2 to connect the oil lines 2a and 2b, 2c provided within input shaft 2, ~~and therefore oil can be supplied~~ to the oil chamber of ~~oil pressure~~ hydraulic servos 11, 12, and 13 without providing the seal rings between, for example, the input shaft 2 and the ~~oil pressure~~ hydraulic servos 11, 12, and 13. Therefore, the oil ~~can be~~ supplied can be connected simply by providing the seal rings 81 and 82 each for the ~~oil pressure~~ hydraulic servos 11, 12, and 13, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, because the counter gear 5 is ~~configured in the axial direction~~ located between the first planetary gear unit PU and the second planetary gear unit PR, the counter gear 5 can be ~~configured~~ located in approximately the center ~~in the~~ axial ~~direction~~ of the automatic transmission. For example, ~~when the automatic transmission is mounted on the vehicle,~~ enlargement towards ~~one direction of the axis (particularly in the rear direction~~ facing ~~from~~ the drive source is the front ~~direction~~) ~~can be prevented~~ is not necessary because the counter gear 5 is ~~mounted to match~~ made with the drive wheel transmission device. Because of this, particularly in the case of an FF vehicle, the interference ~~toward~~ with the front wheels is reduced, ~~and~~ the mountability on a vehicle can be improved, ~~such as~~ and the steering angle can be being greatly increased, for example.

~~Further, in the event that~~ In transmissions where the clutch C3 is placed between the ring gear R1 and the sun gear S3 for example, the clutch C3 the reduced rotation (high torque, low speed) must ~~be~~ engaged and disengaged, and therefore must be ~~becomes~~ relatively large, ~~but~~ However, in the present invention, by placing clutch C3 between the input shaft 2 and the sun gear S1, the engaging and disengaging of the clutch C3 controls transfer of the rotation of the input shaft 2 ~~from this clutch C3 causes~~ to the sun gear and thereby indirectly controls output of the reduced rotation speed ~~output~~ from the ring gear R1. ~~of the planetary gear PR is to be engaged and disengaged, and~~ Therefore, the clutch C3 can be made more compact, and therefore the automatic transmission can be made more compact.

Further, the automatic transmission ~~device~~ 1_3 according to ~~the present~~ this third embodiment is ~~a transmission device that is~~ directly coupled ~~at~~ in fourth speed forward. Therefore, ~~at~~ in fifth speed forward and sixth speed forward, the gear ratio can be ~~specified to~~ a high ratio, and ~~particularly when mounted on a vehicle,~~ in the event that the vehicle is running at a high speed, the engine ~~revolutions~~ speed can be lowered, ~~and this contributes to the quietness of~~ thus allowing the vehicle ~~while~~ to run more quietly at a high speed.

Fourth Embodiment

~~Below,~~ The fourth embodiment, which is a partial modification of the first embodiment, will now be described with reference to Fig. 8 through Fig. 10. ~~Fig. 8 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to~~

the fourth embodiment, Fig. 9 is an operational table of an automatic transmission relating to the fourth embodiment, and Fig. 10 is a speed line diagram of an automatic transmission relating to the fourth embodiment. Now, Components of the fourth embodiment which are the same as those of the first embodiment will be denoted with the same reference numerals, and description thereof omitted, except for partially modified components.

As Fig. 8 illustrates, the automatic transmission device 1_4 of the automatic transmission relating to the fourth embodiment comprises a brake (third brake) B3 instead of the clutch C3, and the carrier CR1 of the planetary gear PR is can be fixed by the brake B3. in comparison with that of the automatic transmission device 1_1 of the automatic transmission of the first embodiment (see Fig. 1).

The brake B3 is configured on the opposite side of the planetary gear unit PU (right side of diagram) of the planetary gear PR within this automatic transmission device 1_4. This brake B3 has an oil pressure servo 16, a friction plate 76, and a hub unit 33.

The hub unit 33 of this brake B3 is connected on one side plate of the carrier CR1, and this carrier CR1 is supported by the boss unit 3a or the input shaft 2. so as to be capable of rotation. Further, the sun gear S1 is connected to the input shaft 2. Further, the friction plate

74 of the brake B1 ~~is~~ are splined to the outer circumferential surface ~~side~~ of the ring gear R1. This ring gear R1 is connected to ~~the transmitting member 30, and~~ the sun gear S3 ~~is connected~~ via ~~this~~ transmitting member 30.

~~Continuing, based on the above-mentioned construction,~~ ~~the~~ Operations of the automatic transmission ~~device~~ 1_4 of the fourth embodiment will now be described below, with reference to Fig. 8, Fig. 9, and Fig. 10. ~~below. Now,~~ As with the above-~~mentioned~~ described first embodiment, the vertical ~~axis~~ axes of the speed line diagram illustrated in Fig. 10 indicate the ~~revolutions~~ speeds of the various ~~each~~ rotation components, and the horizontal axis indicates the corresponding gear ratios of these rotation components. ~~Further,~~ Regarding the first planetary gear unit PU section of this speed line diagram, the vertical axis to the farthest ~~horizontal edge (the~~ right side of Fig. 10 corresponds to sun gear S3, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the vertical ~~axis~~ axes corresponds to the carrier CR2, the ring gear R2, and the sun gear S2. ~~Further,~~ Regarding the second planetary gear unit PR section of this speed line diagram, the vertical axis to the farthest ~~horizontal edge (the~~ right side of Fig. 10 corresponds to sun gear S1, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the vertical axes ~~axis~~ corresponds to the ring gear R1 and the carrier CR1. Further, the widths between these vertical axes are inversely proportional to the ~~inverse of the~~ number of teeth of each

of the sun gears S1, S2, S3, and to ~~the inverse of~~ the number of teeth of each of the ring gears R1, R3. Also, the dotted line ~~in the~~ horizontal ~~direction~~ in the diagram ~~illustrate that~~ represents the rotation ~~is~~ transmitted ~~from~~ by the transmitting member 30.

As Fig. 8 illustrates, the ~~above-mentioned~~ carrier CR1 is fixed to the case 3 by ~~retaining with~~ engagement of the brake B3, whereby ~~Further,~~ the rotation of the input shaft 2 is input to the sun gear S1, and the ~~above-mentioned~~ ring gear R1 rotates at reduced ~~rotations~~ speed, based on the rotation of input shaft 2 ~~which is~~ input to ~~the~~ the sun gear S1 ~~because~~ and the braking of the carrier CR1, ~~is fixed. In other words,~~ By engaging the brake B3, the reduced rotation speed of the ring gear R1 is also input to the sun gear S3 via the transmitting member 30.

~~By doing so,~~ As Fig. 9 and Fig. 10 illustrate, ~~regarding~~ in the planetary gear PR ~~at~~ in third speed forward, fifth speed forward, and first speed reverse, the rotation of the input shaft 2 is input to the sun gear S1 by ~~retaining with~~ engagement of the brake B3 to Six the carrier CR1 ~~is fixed~~, and the reduced speed rotation is output to the ring gear R3 by the input of rotation ~~of~~ to the sun gear S1 ~~wherein the rotation of~~ from the input shaft 2 ~~is input~~, and the ~~is~~ reduced speed rotation is input to the sun gear S3 via the transmitting member 30. In this case, the ring gear R1 and the sun gear S3 are rotating at reduced speed, and therefore the ~~above-mentioned~~

transmitting member 30 ~~performs~~ transmits a relatively large torque, ~~transmission.~~ On the other hand, ~~at~~ in first speed forward, second speed forward, fourth speed forward, and sixth speed forward, the rotation of the sun gear S3 is input to the ring gear R1 via the transmitting member 30, and further, because the brake B3 is released, as Fig. 10 illustrates, the carrier CR1 rotates at a speed based on ~~each the rotation within~~ the speed ~~level of this~~ of ring gear R1 and of the sun gear S1, ~~of the rotation of the input shaft 2.~~

~~Now,~~ The operations of the third embodiment, ~~actions~~ other than those of the ~~above~~ above mentioned planetary gear unit PR are similar to those of the above-described first embodiment (see Fig. 2 and Fig. 3), and accordingly, description thereof will be omitted.

~~As described above, according to~~ In the automatic transmission ~~device~~ 1_3 ~~relating to~~ of third embodiment the ~~present invention~~, due to the planetary gear PR and the clutch C1 being ~~configured~~ located on one side ~~in the axial direction~~ of the first planetary gear unit PU, and the clutch C2 being ~~configured~~ on ~~the~~ its other side ~~in the axial direction of the planetary gear unit PU~~, the second planetary gear unit PR and the first planetary gear unit PU can be ~~configured~~ located more closely together as compared to the case wherein, for example, two clutches C1 and C2 are ~~configured in~~ located between the second planetary gear unit PR and the first planetary gear unit PU, and the transmitting member 30 ~~for~~ which transmitting the reduced speed rotation can be made relatively shorter.

By doing so, the automatic transmission can be made more compact and more lightweight. Further, because the inertia force ~~of~~ inertia can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced.

Further, since the ~~oil pressure~~ hydraulic servos 11 and 12 are ~~provided~~ mounted on the input shaft 2, the seal rings 81 and 82 form seals between the case 3 and ~~supply oil to~~ the oil lines 2a and 2b provided within input shaft 2, and therefore oil can be supplied to the oil chambers of ~~oil pressure~~ hydraulic servos 11 and 12 without providing seal rings between, for example, the input shaft 2 and the ~~oil pressure~~ hydraulic servos 11 and 12. Therefore, oil can be ~~supplied~~ supply connected simply by providing ~~the~~ seal rings 81 and 82 each for the ~~oil pressure~~ hydraulic servos 11 and 12, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, because the counter gear 5 is ~~configured in the~~ located axially ~~direction~~ between the planetary gear unit PU and the planetary gear PR, the counter gear 5 can be ~~configured~~ located in approximately the center ~~in the~~ axial ~~direction~~ of the automatic transmission. ~~For example, when the automatic transmission is mounted on the vehicle,~~ Thus, enlargement towards ~~one direction of the axis (particularly in the rear direction~~ which receives input when the ~~input~~ side from the drive source is the

front ~~direction~~) ~~can be prevented~~ because the counter gear 5 is mounted to ~~match~~ the drive wheel transmission device. Because of this, particularly in the case of ~~a~~ FF vehicle, ~~the~~ interference ~~toward~~ the front wheels is reduced, ~~and the~~ mountability on a vehicle ~~can be~~ improved, ~~such as~~ the steering angle ~~being~~ greatly increased, for example.

Further, because the reduced rotation output to the planetary gear unit PU from the planetary gear PR is ~~engaged~~ and ~~disengaged~~ by the brake B3, the number of parts (for example, drum-shaped members and so forth) can be reduced as compared to the case wherein, for example, a clutch C3 is provided. Further, the brake B3 can ~~configure an~~ oil ~~line~~ directly from the case 3, and therefore the configuration of the oil line can be simplified as compared to ~~the case wherein, for example,~~ a clutch C3, ~~is provided~~.

~~Further,~~ The automatic transmission ~~device~~ 1_4 according to ~~the present~~ embodiment is ~~a transmission device that is~~ directly coupled ~~at~~ fourth speed forward. Therefore, ~~at~~ fifth speed forward and sixth speed forward, the gear ratio can be ~~specified to~~ a high ratio, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine ~~revolutions~~ can be lowered, ~~and this contributes to the quietness of~~ the vehicle ~~while~~ running at high speed.

~~Fifth Embodiment~~

~~Below,~~ The fifth embodiment, which is a partial modification of the first embodiment, will be described below with reference to Fig. 11. ~~Fig. 11 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the fifth embodiment. Now, the fifth embodiment will be described~~ in an abbreviated manner, using the same reference numerals for ~~parts~~ components that are the same as in the first embodiment, ~~except for partial modifications~~.

As Fig. 11 illustrates, the automatic transmission ~~device~~ 1_5 of the ~~automatic transmission relating to the third~~ fifth embodiment ~~is a modification of~~ has the configuration of the planetary gear PR and the clutch C3 ~~from that of~~ modified relative to the automatic transmission ~~device~~ 1_1 of the ~~automatic transmission of the~~ first embodiment (see Fig. 1), and further, a brake B3 is ~~configured, and the~~ provided to fix the carrier CR1 of the second planetary gear unit PR ~~can be fixed by the brake B3.~~ In this fifth embodiment the clutch C3 is ~~configured~~ located on the first planetary gear unit PU side (left side of diagram) of the second planetary gear unit PR ~~within this automatic transmission device 1_5~~, and the brake B3 is ~~configured~~ on the other side of the second unit planetary gear PR, ~~on the~~ opposite ~~side from~~ the first planetary gear unit PU. The inner circumference ~~side~~ of ~~the~~ front ~~edge of~~ the drum ~~shaped member~~ 25 of ~~this~~ clutch C3 is splined to the friction plates 73, ~~and the inner circumference side of this~~ which are intermeshed with friction plates

is splined to the hub unit 26. Further, the drum-shaped member 25 is connected to the input shaft 2, and the hub unit 26 is connected to the sun gear S1.

The brake B3 is configured on the opposite side of the planetary gear unit PR (right side of diagram) of the planetary gear unit PU. This brake B3 comprises an oil pressure servo 16, friction plate 76, and a hub unit 33. The friction plate 76 is splined on the outer circumferene side of the hub unit 33 of this brake B3, and the hub unit 33 is connected to one side plate of the carrier CR1, and this carrier CR1 is supported by the input shaft 2 or the boss unit 3a, so as to rotate. Also, the friction plate 74 of the brake B1 is splined on the outer circumferene side of the ring gear R1, and this ring gear R1 is connected to the transmitting member 30, and the sun gear S3 is connected via this transmitting member 30.

The oil chamber of this oil pressure servo 13 for the clutch C3 is connected to an oil line 2c which is formed as a doubled construction with oil line 2a on the above-mentioned input shaft 2, and this oil line 2c is connected to the oil line 92 of the boss unit 3a of the case 3. Further, this oil line 92 is connected to an oil pressure control unit, not illustrated. In other words, because the above-mentioned oil pressure servo 11 and the oil pressure servo 13 are configured on input shaft 2, an oil line from

the oil pressure control unit, not illustrated, is connected to the oil chamber of the ~~oil pressure~~ hydraulic servo 11 and ~~the oil pressure servo 13 is configured,~~ 13 simply by providing seal ring 81 ~~to seal~~ between the boss ~~unit~~ 3a ~~of the case 3~~ and the input shaft 2.

~~Continuing, based on the above mentioned construction, the~~ Operations of the automatic transmission ~~device~~ of the fifth embodiment 1_5 will now be described below, with reference to Fig. 11, ~~Fig. 2, and Fig. 3 below. Now, the present~~ and, because the fifth embodiment is similar to the first embodiment, ~~and therefore will be described based on~~ with reference to the engagement chart and the speed line diagram ~~described in~~ for the first embodiment (see Fig. 2 and Fig. 3).

As Fig. 11 illustrates, the rotation of input shaft 2 is input to the ~~above-mentioned~~ sun gear S1 by engaging the clutch C3. Further, the ~~rotation of the above mentioned~~ carrier CR1 is fixed to the case 3 by engagement of the brake B3. ~~retaining.~~ Therefore, upon engagement of the clutch C3 ~~engaging~~ and the brake B3 ~~retaining~~, the ~~above-mentioned~~ ring gear R1 will rotate at a reduced speed ~~rotations~~ based on the rotation of input shaft 2 which is input to ~~this~~ sun gear S1. In other words, by engaging the clutch C3 and ~~retaining~~ the brake B3, the reduced speed rotation of the ring gear R1 is input to the sun gear S3 via the transmitting member 30.

By doing so, as Fig. 2 and Fig. 3 illustrate, regarding the planetary gear PR, ~~at~~ in third speed forward, fifth speed

forward, and first speed reverse, the rotation of the input shaft 2 is input to the sun gear S1 by engaging the clutch C3, and further, the carrier CR1 is fixed by ~~retaining~~ engagement of the brake B3, and therefore the reduced speed rotation is output to the ring gear R3 ~~by~~ through the fixed carrier CR1, and from the ~~reduced rotation is input~~ ring gear R3 to the sun gear S3 via the transmitting member 30. ~~In this case,~~ Because the ring gear R1 and the sun gear S3 are rotating at a reduced speed, ~~therefore the above-mentioned~~ the transmitting member 30 ~~performs~~ transmits a relatively large torque ~~transmission~~. ~~On the other hand, at~~ In first speed forward, second speed forward, fourth speed forward, and sixth speed forward, the rotation of the sun gear S3 is input to the ring gear R1 via the transmitting member 30, but because the clutch C3 and the brake B3 are released, the carrier CR1 and the sun gear S1 ~~are~~ freely rotate.

~~Now, the actions~~ Operations of the sixth embodiment other than those of the ~~above-mentioned~~ second planetary gear unit PR, are similar to those of the ~~above-described~~ first embodiment (see Fig. 2 and Fig. 3), and accordingly description thereof will not be repeated here. ~~omitted.~~

As described above, ~~according to~~ in the automatic transmission ~~device~~ 1s ~~relating to the present invention~~, due to the location of second planetary gear unit PR and the clutch C1 ~~being configured~~ on one side ~~in the axial direction~~ of the first planetary gear unit PU, and the clutch C2 being ~~configured~~ located on the other side ~~in the axial direction~~ of the first planetary

gear unit PU, the planetary gear PR and the planetary gear unit PU can be configured closely together, compared to the case wherein, for example, two clutches C1 and C2 are configured in between the planetary gear PR and planetary gear unit PU, and the transmitting member 30 for transmitting reduced rotation can be relatively shortened. By doing so, the automatic transmission can be made more compact and more lightweight. Further, because the inertia (force of inertia) can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced. Further, compared to the case wherein three clutches C1, C2, C3 are configured on one side of the planetary gear unit PU, the oil lines (for example, 2a, 2b, 91, 92, 93) that supply the oil pressure servos 11, 12, and 13 of these clutches C1, C2, C3 can be constructed easily, and the manufacturing process can be simplified and the costs brought down.

Further, since the oil pressure servos 11, 12, and 13 are provided on the input shaft 2, the seal rings 81 and 82 seal the case 3 and supply oil to the oil lines 2a and 2b, 2c provided within input shaft 2, and therefore oil can be supplied to the oil chamber of oil pressure servos 11, 12, and 13 without providing the seal rings between, for example, the input shaft 2 and the oil pressure servos 11, 12, and 13. Therefore, oil can be supplied simply by providing the seal

~~rings 81 and 82 each for the oil pressure servos 11, 12, and 13, and~~ sliding resistance from the seal rings can be minimized, and ~~therefore~~ the efficiency of the automatic transmission can be improved.

Further, due to the counter gear 5 being ~~configured in the axial direction~~ located between the first planetary gear unit PU and the second planetary gear unit PR, the counter gear 5 can be ~~configured~~ located in approximately the center ~~in the~~ axial ~~direction~~ of the automatic transmission. For example, when the automatic transmission is mounted on ~~the~~ a vehicle, enlarg~~ing~~ement towards ~~one direction of the axis (particularly in~~ the rear ~~direction~~ facing when the input side ~~from~~ the drive source is the front ~~direction~~) is not necessary ~~can be prevented~~ because the counter gear 5 is mounted to ~~match~~ mate with the drive wheel transmission device. Because of this, particularly in the case of a FF vehicle, ~~the~~ interference ~~toward~~ with the front wheels is reduced, ~~and the~~ mountability on a vehicle ~~can be~~ is improved, ~~such as~~ and the steering angle ~~being~~ is greatly increased, ~~for example.~~

~~Further~~ Again, ~~in the event that~~ where the clutch C3 is placed between the ring gear R1 and the sun gear S3 ~~for example~~, it must be sufficiently large to transmit the high torque, ~~the~~ reduced rotation ~~must be engaged and disengaged, and becomes relatively large~~, but by placing the clutch C3 between the input shaft 2 and the sun gear S1, it can indirectly control ~~the engaging and disengaging of the rotation of the input shaft 2 from this clutch C3 causes~~ ~~the~~ reduced speed rotation output of from the ring gear R1 of the second

planetary gear unit PR ~~to be engaged and disengaged~~, and therefore ~~clutch C2~~ can be made more compact, and ~~therefore~~ likewise the automatic transmission can be made more compact.

Further, the automatic transmission ~~device~~ 1_5 according to the ~~present~~ Fifth embodiment is ~~a transmission device that is~~ directly coupled ~~at~~ in fourth speed forward. Therefore, ~~at~~ in fifth speed forward and sixth speed forward, the gear ratio can be ~~specified to~~ a high ratio, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine ~~revolutions~~ speed can be lowered, ~~and this contributes to the quietness of the vehicle while running~~ thereby allowing the To run more quietly at a high speed.

~~Sixth Embodiment~~

~~Below, the~~ A sixth embodiment, which is a partial modification of the first embodiment, will now be described with reference to Fig. 12. ~~Fig. 12 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the sixth embodiment. Now,~~ Components of the sixth embodiment which are the same as those of the first embodiment ~~will be~~ are denoted ~~with~~ by the same reference numerals, and description thereof omitted, except for those components partial modifications.

As Fig. 12 illustrates, the automatic transmission ~~device~~ 1_6 of the ~~automatic transmission relating to the~~ sixth embodiment ~~configures~~ has the clutch C2 located on ~~one side in the~~

~~axial direction wherein the~~ planetary gear PR of the planetary gear unit PU ~~is configured~~, and the clutch C2 is ~~configured~~ on ~~the~~ other side ~~in the axial direction~~, in other words, the ~~configuration is such that~~ the positions ~~where~~ the clutch C1 and the clutch C2 ~~are disposed are~~ switched as compared to that of the automatic transmission ~~device~~ 1_1 of the ~~automatic transmission of the~~ first embodiment (see Fig. 1).

This automatic transmission ~~device~~ 1_6 ~~comprises~~ a multi-disc clutch C2 comprising ~~an oil pressure~~ servo 12, ~~a~~ friction plate 72, ~~a drum shaped member 23 that forms a~~ clutch drum, a hub unit 24 linked to a sun gear S2 ~~on the inner circumference side~~ of the ~~above-mentioned~~ input shaft 2, and a multi-disc clutch C3 comprising ~~an oil pressure~~ servo 13, friction plate 73, ~~a drum-shaped member 25 that forms~~ a clutch drum, a hub unit 24 linked to a sun gear S2 ~~on~~ the outer circumference ~~side~~. ~~Further,~~ a multi-disc brake B1 comprising ~~an oil pressure~~ servo 14 and friction plate 74.

The ~~above~~ drum-~~shaped member~~ 23 is connected to the ~~above~~ input shaft 2, and ~~on~~ the inner circumference ~~side~~ of ~~the~~ front ~~edge of this drum-shaped member 23 is configured~~ by ~~splining~~ to the friction plate 72 of the clutch C2 which can be engaged by the ~~oil pressure~~ servo 12 ~~of the clutch C2~~, and the ~~inner circumference side of the~~ friction plate 72 ~~of~~

with friction plates splined
~~this clutch C2 is connected~~ to the hub unit 24 ~~by splining~~. Further, this hub unit 24 is connected to the above-mentioned carrier CR2.

~~On the other hand, on~~ At the other ~~edge~~ end of the input shaft 2 (left side of the diagram) is ~~configured~~ a multi-disc clutch C1 comprising ~~an oil pressure~~ a hydraulic servo 11, friction plate 71, a ~~drum-shaped member 21 that forms a~~ clutch drum 21, and a hub unit 22 linked to a sun gear S2.

~~Further, on the above-mentioned input shaft 2, as in the left side of the diagram, the drum-shaped member 21 is connected, on~~ The inner circumference side surface of the front edge portion of this drum-shaped member 21 is ~~configured by means of~~ splining ed to the friction plate 71 of the clutch C1 that can be engage d by operation of the ~~oil pressure~~ hydraulic servo 11, ~~for the clutch C1.~~ The ~~inner circumference side~~ of the friction plate 71 ~~of~~ are intermeshed with friction plates splined to ~~this clutch C1~~ which the hub unit 22 ~~is splined, and this hub unit~~ 22 is connected to the ~~above-mentioned~~ sun gear S2.

The operations of the automatic transmission ~~device~~ 1_6 ~~based on the above construction,~~ of the sixth embodiment are similar to those of the ~~above-mentioned~~ first embodiment (see Fig. 2 and Fig. 3), and accordingly description thereof will be omitted here.

~~As described above, according to~~ In the automatic transmission ~~device~~ 1_6 ~~relating to the present invention~~ of this sixth embodiment, due to the second planetary gear unit PR and the clutch C2 being ~~configured~~ located on one side ~~in the axial direction~~ of the

planetary gear unit PU, and the clutch C1 being ~~configured~~ on the other side ~~in the axial direction~~ of the planetary gear unit PU, the planetary gear PR and the planetary gear unit PU can be ~~configured~~ closely together, compared to ~~the case~~ wherein, for example, two clutches C1 and C2 are ~~configured in~~ between the planetary gear PR and planetary gear unit PU, and the transmitting member 30 ~~for transmitting reduced rotation~~ can be relatively shortened. ~~By doing so~~, the automatic transmission can be made more compact and more lightweight. Further, because the inertia (force ~~of~~ inertia) can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced. Further, compared to ~~the case~~ wherein three clutches C1, C2, C3 are ~~configured~~ on one side of the planetary gear unit PU, the oil lines (for example, 2a, 2b, 91, 92, 93) that supply the ~~oil pressure~~ servos 11, 12, and 13 of these clutches C1, C2, C3 can be constructed easily, ~~and~~ the manufacturing process can be simplified, and the costs ~~brought down~~.

Further, since the ~~oil pressure~~ servos 11 and 12 are ~~provided~~ on the input shaft 2, one set of seal rings 81 ~~and~~ 82 ~~seal the case 3 and~~ supply oil ~~to~~ the oil lines 2a and 2b ~~provided~~ within input shaft 2, and therefore oil can be supplied to the oil chamber of ~~oil~~ pressure servos 11 and 12 without providing the seal rings between, for example, the

input shaft 2 and the ~~oil pressure~~ hydraulic servos 11 and 12. Further, the ~~oil pressure~~ hydraulic servo 13 can receive oil directly from the boss ~~unit~~ 3a extended from the case 3, i.e. without passing through other parts ~~for example~~, and therefore ~~can~~ the oil can be connected supply oil by providing one set of seal rings 80. Therefore, ~~oil can be supplied simply by providing one set of seal rings 81 and 82 each for the oil pressure servos 11 and 12, and~~ sliding resistance from the seal rings can be minimized, and ~~therefore~~ the efficiency of the automatic transmission can be improved.

~~Further,~~ Since the clutch C2 is ~~configured on the inner circumference side~~ located radially inward of the clutch C3, the clutch C3, which must transmit a relatively large torque, ~~in order to transmit the reduced~~ low speed rotation, can be ~~configured on~~ located near the outer circumference ~~side~~, and this clutch C3 and ~~the oil pressure~~ its hydraulic servo 13 ~~thereof~~ can have an increased diameter, a larger ~~Particularly the~~ pressure receiving area ~~of the oil chamber of the oil pressure servo 13 can be enlarged~~, and ~~the capacity capable of~~ a larger capacity. Further, by giving torque transmission ~~of this clutch C3 can be increased. By configuring~~ the clutch C2 ~~which can have~~ a smaller ~~capacity for~~ capacity torque transmission compared to the clutch C3, the automatic transmission can be made more compact.

~~Further~~, As with the previously described embodiments because the counter gear 5 is ~~configured in the~~ located axial ~~direction~~ between the first planetary gear unit PU and the second planetary gear PR, the counter gear 5 can be ~~configured~~ located

in approximately the center ~~in the~~ axial ~~direction~~ of the automatic transmission. For example, when the automatic transmission is mounted on the vehicle, enlargement towards ~~one direction of the axis (particularly in~~ the rear ~~direction~~ when the input side facing ~~from~~ the drive source is the front ~~direction~~) ~~can be prevented~~ is unnecessary because the counter gear 5 is mounted to ~~match~~ mate with the drive wheel transmission device. Because of this, particularly in the case of an FF vehicle, ~~the~~ interference ~~toward~~ with the front wheels is reduced, ~~and~~ the mountability on a vehicle ~~can be~~ is improved, ~~such as~~ and the steering angle ~~being~~ is greatly increased. ~~for example.~~

Further, the clutch C1 ~~is a clutch which~~ engages at the relatively slow to medium speed ~~levels~~ of first speed forward, second speed forward, third speed forward, and fourth speed forward, and therefore when ~~this~~ clutch C1 is released at the relatively high speed ~~levels~~ of fifth speed forward, sixth speed forward, or first speed reverse, ~~particularly~~ the hub unit 22 that connects this clutch C1 and the sun gear S2, in particular, rotates at a relatively high ~~revolution~~ speed or ~~revolves~~ in reverse (see Fig. 7). On the other hand, ~~at the~~ in fifth speed forward and first speed reverse the transmitting member 30 ~~reduces rotation~~ rotates at a reduced speed, and ~~at the~~ in sixth speed forward the transmitting member 30 may be fixed ~~in some cases~~, and the difference in ~~revolutions~~ rotational speed between the hub unit 22 and the transmitting member 30 can ~~occur~~ be great. However,

because this clutch C1 is located on the ~~opposite~~ side of the planetary gear ~~PR via~~ the planetary gear unit ~~PU~~, the hub unit 22 and the transmitting member 30 can be ~~configured~~ apart from one another. Compared with a ~~case~~ wherein these units are in contact due to a multi-axial configuration ~~for example~~, decreased efficiency of the automatic transmission resulting from friction and so forth from the relative rotation of those units can be prevented.

Further, the automatic transmission ~~device~~ 1_6 according to the ~~present~~ embodiment is ~~a transmission device that is~~ directly coupled ~~at~~ fourth speed forward. Therefore, ~~at~~ in fifth speed forward and sixth speed forward, the gear ratio can be ~~specified to~~ a high ratio, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine ~~revolutions~~ can be lowered, ~~and this contributes to the quietness of the~~ vehicle ~~while~~ running at a high speed.

~~Now, the linking~~ member ~~(in particular~~ the transmitting member ~~for~~ linking the planetary gear PR and the planetary gear unit PU ~~requires~~ rigidity to withstand the reduced speed torque that ~~is input~~. For example, ~~in the case of configuring~~ a clutch that engages at a slow to medium speed or a clutch that engages and disengages reduced rotation ~~on the inner circumference side of the linking member, the clutches~~ must have a large capacity, therefore a

appropriate diameter ~~to correspond with~~ for this capacity becomes necessary. Therefore, in the event that the transmitting (linking) member ~~is the type that~~ passes radially on the outer ~~circumference~~ side of this type of clutch, an even larger diameter ~~than the necessary diameter measurement of~~ for those clutches becomes necessary, ~~and~~ the diameter ~~measurement~~ of the ~~linking~~ transmitting member is enlarged more than necessary, and the radial dimension of the automatic transmission as a whole becomes greater ~~in the radial direction~~. Accordingly, it is an object of this embodiment to reduce ~~the enlargement of~~ the diameter ~~measurement~~, and thereby provide a more compact automatic transmission.

~~According to the present~~ In this sixth embodiment, all clutches can be ~~configured without~~ arranged so as to avoid need for enlarging the diameter ~~measurement~~ of the linking member, ~~by configuring~~ specifically by arranging a clutch C2 with a small capacity ~~on the linking member, particularly~~ on the ~~inner circumference~~ radially inward side of the transmitting member 30.

~~Seventh Embodiment~~

The seventh embodiment is ~~partially modified from~~ a modification of the sixth embodiment and will be described ~~now~~ with reference to Fig. 13. ~~Fig. 13 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the seventh embodiment.~~ ~~Now,~~ Components of the seventh embodiment which are the same as those of the sixth embodiment ~~will be~~ are denoted by the same reference numerals, and description thereof omitted, here

except for partial modifications.

As Fig. 13 illustrates, the automatic transmission device 1_7 of the automatic transmission relating to the seventh embodiment is a modification of the configuration of the planetary gear PR and the clutch C2 and the clutch C3, compared to that of the automatic transmission device 1_6 of the automatic transmission of the sixth embodiment (see Fig. 12).

The clutch C2 and the clutch C3 is configured on the opposite side of the planetary gear unit PU (right side of diagram) of the planetary gear PR within this automatic transmission device 1_7. The inner circumference side of the front edge of the drum-shaped member 25 of this clutch C3 is splined to the friction plate 73, and the inner circumference side of this friction plate 73 is splined to the hub unit 26. The drum-shaped member 25 is connected to the input shaft 2, and the hub unit 26 is connected to the sun gear S1 of the planetary gear PR. Further, the clutch C2 comprising a oil pressure servo 12, a friction plate 72, a drum-shaped member 23, and a hub unit 24 is configured on the inner circumference side of the above-mentioned clutch C3, that is to say, is enclosed within the hub unit 26.

On the other hand, on the outer circumference side of the planetary gear PR is configured a multi-disc brake B1 that comprises an oil pressure servo 14 and a friction plate

74. The side plate of the carrier CR1 of this planetary gear PR is fixed and supported by the case 3. Further, the ring gear R1 is connected to the transmitting member 30, and the friction plate 74 of the brake B1 is splined to the outer circumference side of this transmitting member 30, and this transmitting member 30 is connected to the sun gear S3.

The operations of the automatic transmission device 1, based on the above construction, are similar to those of the third embodiment (see Fig. 6 and Fig. 7), and accordingly description thereof will be omitted.

As described above, according to the automatic transmission device 1, relating to the present invention, due to the planetary gear PR and the clutch C2 being configured on one side in the axial direction of the planetary gear unit PU, and the clutch C1 being configured on the other side in the axial direction of the planetary gear unit PU, the planetary gear PR and the planetary gear unit PU can be configured closely together, compared to the case wherein, for example, two clutches C1 and C2 are configured in between the planetary gear PR and planetary gear unit PU, and the transmitting member 30 for transmitting reduced rotation can be relatively shortened. By doing so, the automatic transmission can be made more compact and more lightweight. Further, because the inertia (force of inertia) can be reduced, the controllability of

the automatic transmission can be increased, and the occurrence of speed change shock can be reduced. Further, compared to the case wherein three clutches C1, C2, C3 are ~~configured~~ located on one side of the first planetary gear unit PU, the oil lines (for example, 2a, 2b, 91, 92, 93) that supply the ~~oil pressure~~ hydraulic servos 11, 12, and 13 of these clutches C1, C2, C3 can be more constructed easily, ~~and~~ the manufacturing process can be simplified, and the cost ~~is brought down~~ can be reduced.

Further, since the ~~oil pressure~~ hydraulic servos 11 and 12 are ~~provided~~ mounted on the input shaft 2, one set of seal rings 81 and 82 ~~seal~~ serve to connect the case 3 and supply oil from ~~to~~ the oil lines 2a and 2b provided within input shaft 2, and therefore oil can be supplied to the oil chambers of ~~oil pressure~~ hydraulic servos 11 and 12 without providing ~~the~~ seal rings between, for example, the input shaft 2 and the ~~oil pressure~~ hydraulic servos 11 and 12. Further, the ~~oil pressure~~ hydraulic servo 13 can be supplied directly with oil from the boss ~~unit~~ 3a extended from the case 3, i.e. without passing through other ~~parts for example~~ components, and therefore ~~can~~ oil can be supplied by providing one set of seal rings 80. Therefore, ~~oil can be supplied simply by providing one set of seal rings 81, 82, and 80 each for the oil pressure servos 11, 12, and 13, and~~ sliding resistance from the seal rings can be minimized, and ~~therefore the~~ efficiency of the automatic transmission can be improved.

Further, since the counter gear 5 is ~~configured in the~~ located

axial direction between the planetary gear unit PU and the planetary gear PR, the counter gear 5 can be configured in approximately the center in the axial direction of the automatic transmission. For example, when the automatic transmission is mounted on the vehicle, enlarging toward one direction of the axis (particularly in the rear direction when the input side from the drive source is the front direction) can be prevented because the counter gear 5 is mounted to match the drive wheel transmission device. Because of this, particularly in the case of a FF vehicle, the interference toward the front wheels is reduced, and the mountability on a vehicle can be improved, such as the steering angle being greatly increased, for example.

Further, the clutch C1 is a clutch which engages at the relatively slow to medium speed levels of first speed forward, second speed forward, third speed forward, and fourth speed forward, and therefore when this clutch C1 is released at the relatively high speed levels of fifth speed forward, sixth speed forward, or first speed reverse, particularly the hub unit 22 that connects this clutch C1 and the sun gear S2 rotates at a relatively high revolution or revolves in reverse (see Fig. 7). On the other hand, at a fifth speed forward or first speed reverse the transmitting member 30 reduces rotation speed, and at a sixth speed forward the transmitting member 30 can engage,

whereby there can be a large speed as and difference in ~~revolutions~~ between the hub unit 22 and the transmitting member 30, ~~can occur~~. However, because ~~this~~ clutch C1 is located on the ~~opposite~~ side of the first planetary gear unit PU ~~via~~ the opposite second planetary gear unit PR, the hub unit 22 and the transmitting member 30 can be ~~configured~~ spaced apart from one another. In comparison with a transmission ~~the case~~ wherein, for example, these members are in contact due to a multi-axial configuration, decreased efficiency of the automatic transmission resulting from friction and so forth from the relative rotation ~~of those units~~ can be prevented.

~~Further, in the event that~~ If the clutch C3 were to be ~~is~~ placed between the ~~ring gear R1 and the sun gear S3, for example,~~ the reduced speed rotation if must ~~be~~ engaged and disengaged, and therefore must be ~~becomes~~ relatively large, ~~but~~ However, by placing The clutch C3 between the input shaft 2 and the sun gear S1, the engaging and disengaging of the rotation of the input shaft 2 ~~from this~~ by clutch C3 indirectly ~~causes~~ controls output of the reduced rotation ~~output~~ from the ring gear R1 of the second planetary gear unit PR ~~to be engaged and disengaged~~, and therefore the clutch C3 ~~can be made more compact,~~ and ~~therefore~~ the automatic transmission as a whole can be made more compact.

Further, the automatic transmission ~~device~~ 1, according to the seventh ~~present~~ embodiment is ~~a transmission device that is~~ directly coupled ~~at~~ in fourth speed forward. Therefore, ~~at~~ in fifth speed forward and sixth speed forward, the gear ratio can be ~~specified to~~ a high ratio, and particularly when

~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine ~~revolutions~~ speed can be lowered, ~~and this contributes to the quietness of~~ thereby allowing the vehicle ~~while running~~ to run more quietly at a high speed.

~~Now, when~~ If a clutch ~~is configured in~~ were to be located between the ~~planetary gear~~ second unit PR and the ~~planetary gear~~ first unit PU, for example, the length of the linking member (~~particularly the transmitting member~~) second unit that links the ~~planetary gear~~ first unit PR and the ~~planetary gear~~ first unit PU ~~becomes longer in the direction,~~ must be axially elongated and because this ~~linking~~ transmitting member ~~is for transmitting~~ the reduced ~~rotation~~ speed, the thickness of the unit must be increased so as to withstand ~~this~~ the high torque, and therefore the weight ~~also~~ is increased. Therefore an object of the present invention is to provide an automatic transmission ~~that can shorten~~ wherein the distance between the speed ~~reduction~~ reducing second planetary gear unit and the ~~planetary gear unit~~ first unit, and ~~reduce the increase in~~ the weight is thereby reduced.

~~With the present~~ In this seventh embodiment, in particular, the clutch C2 is ~~disposed~~ located on the ~~opposite~~ side ~~in the axial direction~~ of the ~~planetary gear unit~~ second unit PU ~~from~~ PR axially opposite the ~~planetary gear~~ first unit PR, and therefore, ~~providing~~ locating a clutch between the ~~planetary gear~~ first and second units PR and the ~~planetary gear unit PU~~ is not necessary, and the length of the ~~linking~~ transmitting member, ~~particularly the transmitting member~~ 30 can be made that much shorter. Therefore, ~~increase in~~ the weight of the automatic transmission as a whole

can be prevented.

Eighth Embodiment

Now, the eighth embodiment which is a partial modification of the sixth embodiment will be described with reference to Fig. 14. Fig. 14 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the eighth embodiment. Now, components of the eighth embodiment which are the same as those of the sixth embodiment will be denoted with the same reference numerals, and description thereof omitted, except for partial modifications.

As Fig. 14 illustrates, the automatic transmission device 1_8 of the automatic transmission relating to the eighth embodiment is a modification of the configuration of the clutch C2, and further, configures a brake B3 instead of a clutch C3, and enables the carrier CR1 of planetary gear PR to be fixed by the brake B3, as compared with that of the automatic transmission device 1_6 of the automatic transmission of the first embodiment (see Fig. 12).

Within the automatic transmission device 1_8, the brake B3 is configured on the planetary gear PR on the opposite (right side on the diagram) from the planetary gear unit PU. This brake B3 comprises an oil pressure servo 16, a friction plate 76, and a hub unit 33. Further, the clutch C2, comprising an oil pressure servo 12, a friction plate 72, a

drum-shaped member 23, and a hub unit 24, is configured on the inner circumference side of above mentioned brake B3, that is to say, is enclosed within the hub unit 33. The hub unit 33 of this brake B3 is connected to the side plate of one side of the carrier CR1, and the side plate of the other side of this carrier CR1 is supported by the input shaft 2 so as to be capable of rotating. Further, the sun gear S1 is connected to the input shaft 2 via the drum-shaped member 24 of the clutch C2. Also, the friction plate 74 of the brake B1 is splined with the outer circumference side of the ring gear R1, and this ring gear R1 is connected to the transmitting member 30, and is connected to the sun gear S3 via this transmitting member 30.

The operations of the automatic transmission device 1_8 based on the above construction, are similar to those of the fourth embodiment (see Fig. 9 and Fig. 10), and accordingly description thereof will be omitted.

As described above, according to the automatic transmission device 1_8 relating to the present invention, due to the planetary gear PR and the clutch C2 being configured on one side in the axial direction of the planetary gear unit PU, and the clutch C1 being configured on the other side in the axial direction of the planetary gear unit PU, the planetary gear PR and the planetary gear unit PU can be configured closely together, compared to the

~~case~~ wherein, for example, two clutches C1 and C2 are ~~configured in~~ between ~~the~~ planetary gear ~~PR and planetary gear unit PU~~, and the transmitting member 30 ~~for transmitting reduced rotation~~ can be relatively ~~shorted~~. By doing so, the automatic transmission can be made more compact and more lightweight. Further, because the inertia (force ~~of~~ inertia) ~~can be~~ reduced, the controllability of the automatic transmission ~~can be~~ increased, and the occurrence of speed change shock ~~can be~~ reduced.

Further, since the ~~oil pressure~~ servos 11 and 12 are ~~provided~~ on the input shaft 2, the seal rings 81 and 82 ~~seal the case 3 and~~ supply oil ~~to~~ the oil lines 2a and 2b provided within input shaft 2, and therefore oil can be supplied to the oil chamber of ~~oil pressure~~ servos 11 and 12 without providing the seal rings between, for example, the input shaft 2 and the ~~oil pressure~~ servos 11 and 12. Therefore, ~~oil can be supplied simply by providing the seal rings 81 and 82 each for the oil pressure servos 11 and 12,~~ and sliding resistance from ~~the~~ seal rings can be minimized, and ~~therefore~~ the efficiency of the automatic transmission can be improved.

Further, since the counter gear 5 is ~~configured in the axial direction~~ between the planetary gear unit ~~PU and the planetary gear PR~~, the counter gear 5 ~~can be configured~~ in approximately the center ~~in the~~ axial ~~direction~~ of the

automatic transmission. ~~For example, when the automatic transmission is mounted on the vehicle,~~ enlarging towards ~~one direction of the axis (particularly in~~ the rear ~~direction~~ when the input side ~~from~~ the drive source is the front ~~direction~~) ~~can be prevented~~ because the counter gear 5 is mounted to ~~match~~ the drive wheel transmission device. Because of this, particularly in the case of a FF vehicle, ~~the~~ interference ~~toward~~ the front wheels is reduced, ~~and the~~ mountability on ~~a~~ vehicle ~~can be~~ improved, ~~such as~~ the steering angle ~~being~~ greatly increased, ~~for example~~.

Further, the clutch C1 ~~is a clutch which~~ engages at the relatively slow to medium speed ~~levels~~ of first speed forward, second speed forward, third speed forward, and fourth speed forward, and therefore when this clutch C1 is released at the relatively high speed levels of fifth speed forward, sixth speed forward, or first speed reverse, ~~particularly~~ the hub unit 22 that connects this clutch C1 and the sun gear S2 rotates at a relatively high ~~revolution~~ or ~~revolves~~ in reverse (see Fig. 10). On the other hand, ~~at~~ ~~the~~ fifth speed forward or first speed reverse the transmitting member 30 reduced ~~rotation~~ speed, and ~~at a~~ sixth speed forward the transmitting member 30 may be fixed in some cases, and difference in ~~revolutions~~ between the hub unit 22 and the transmitting member 30 can ~~occur~~. However, because ~~this~~ clutch C1 is located on the ~~opposite~~ side of

the planetary gear ~~PR via~~ the planetary gear unit ~~PU~~, the hub unit 22 and the transmitting member 30 can be ~~configured~~ apart from one another. In comparison with ~~the case~~ wherein, for example, these members are in contact due to a multi-axial configuration, ~~decreased~~ efficiency of the automatic transmission resulting from friction and so forth from the relative rotation of those units can be prevented.

Further, because the reduced rotation output to the planetary gear unit PU from the planetary gear PR is ~~made to be~~ engaged and disengaged by the brake B3, the number of parts (for example drum-shaped members and so forth) can be reduced as compared to ~~the case wherein, for example, a~~ clutch C3 ~~is provided~~. Further, the brake B3 can ~~configure an oil line~~ directly from the case 3, and therefore the configuration of the oil line can be simplified as compared ~~to the case wherein, for example,~~ a clutch C3. ~~is provided.~~

Further, the automatic transmission ~~device~~ 1_8 according to the ~~present~~ embodiment is ~~a transmission device that is~~ directly coupled ~~at~~ fourth speed forward. Therefore, ~~at~~ in fifth speed forward and sixth speed forward, the gear ratio can be ~~specified to~~ a high ratio, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine ~~revolutions~~ can be lowered, ~~and this contributes to the quietness of the~~ vehicle ~~while~~ running at a high speed.

~~Now, when~~ IS a clutch is ~~configured in~~ located between the first and second ~~planetary gear PR and the~~ planetary gear unit ~~PU for example~~, the length of the ~~linking member (particularly the~~ transmitting member ~~)~~ that links the ~~planetary gear PR~~ first and ~~the~~ second planetary gear unit PU ~~becomes longer in the~~ must be axially elongated ~~direction~~, and since this ~~linking~~ transmitting member ~~is for~~ transmits the reduced speed rotation, ~~the~~ its thickness ~~of the member~~ must be increased so as to withstand a high torque ~~this~~, and therefore the weight is also increased. Therefore, an object of the present invention is to provide an automatic transmission ~~that can~~ in which ~~shorten~~ the distance between the speed reducing second planetary gear unit and the first planetary gear unit is shortened and the ~~increase in~~ weight is thereby reduced.

~~With the present~~ In this eighth embodiment, in particular, the clutch C2 is disposed on ~~the opposite~~ side ~~in the axial direction~~ of the second planetary gear unit ~~PU from~~ PR axially opposite the first planetary gear unit PU, and therefore, ~~providing~~ provision of a clutch between the planetary gear units ~~PR and the planetary gear unit PU~~ is not necessary, and the length of the ~~linking member, particularly~~ the transmitting member 30 can be made that much shorter. Therefore, ~~an increase in~~ weight of the automatic transmission as a whole can be ~~prevented~~ reduced.

~~Ninth~~ Ninth Embodiment

~~Below, T~~The ninth embodiment, which is a partial modification of the first embodiment, will now be described

with reference to Fig. 15. Fig. 15 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the ninth embodiment. Now, components of the ninth embodiment which are the same as those of the first embodiment will be denoted with the same reference numerals, and description thereof omitted, except for partial modifications.

As Fig. 15 illustrates, the automatic transmission device 1_9 of the automatic transmission relating to the ninth embodiment configures a clutch C2 on one side in the axial direction wherein the planetary gear PR of the planetary gear unit PU is configured, and configures the clutch C1 and the counter gear 5 on the other side in the axial direction, that is to say, interchanges the locations of the clutch C1 and the clutch C2, and further, the positions of the planetary gear PR, the clutch C3, and the brake B1 are configured on the opposite side of the counter gear 5 of the planetary gear unit PU, as compared to that of the automatic transmission device 1_1 of the automatic transmission of the first embodiment (see Fig. 1).

Within the automatic transmission device 1_9, on the above-mentioned input shaft 2 is configured a multi-disc clutch C1, which comprises an oil pressure servo 11, a friction plate 71, a drum-shaped member 21 that forms a clutch drum, and a hub unit 22 liked to a sun gear S2 on the

radially
inner ~~circumference~~ side.

The oil chamber of this ~~oil pressure~~ hydraulic servo 11 is connected to ~~an~~ oil line 2a which ~~is formed on the above-mentioned input shaft 2, and this oil line 2a is provided along one edge of the case 3, and~~, in turn, is connected to the oil line 91 of the boss ~~unit~~ 3a in the form of a sleeve surrounding one end of ~~which is provided on~~ the input shaft 2 ~~in a sleeve form~~. ~~Further, this~~ Oil line 91 ~~is~~ connected to the ~~an~~ oil pressure control unit, not illustrated. In other words, since the above-mentioned ~~oil pressure~~ hydraulic servo 11 is mounted ~~configured~~ on input shaft 2, ~~an~~ oil ~~line~~ supply from the oil pressure control unit, ~~not illustrated,~~ to the oil chamber of the oil pressure servo 11 is ~~configured~~ connected simply by providing one set of seal rings 81 ~~to seal~~ between the boss ~~unit~~ 3a ~~of the case 3~~ and the input shaft 2.

The ~~above-mentioned~~ input shaft 2 is connected to the ~~above-mentioned~~ drum-shaped member 21, ~~and on the~~ having an inner ~~circumference side of this drum shaped member 21 is configured~~ surface to which the friction plates 71 of the clutch C1 ~~which is capable of engaging by the oil pressure servo 11 for the clutch C1,~~ are splined, ~~and is connected wherein the inner circumference side of~~ edges The friction plates 71 of this clutch C1 ~~is~~ are intermeshed with friction plates which, in turn, is splined to the hub unit 22. ~~Further, this hub unit 22~~ is connected to the ~~above mentioned~~ sun gear S2.

~~On the other hand,~~ On the other side of the input shaft 2 (left side in diagram) is ~~configured~~ a multi-disc clutch C2

that has ~~an oil pressure~~ a hydraulic servo 12, ~~a~~ friction plates 72, a ~~drum shaped member 23 that forms~~ a clutch drum 23, and a hub unit 24 linked to a carrier CR2. On the outer circumference side is ~~configured~~ a multi-disc clutch C3 that comprises an oil pressure servo 13, a friction plate 73, and a clutch drum ~~unit~~ 25, ~~that forms a clutch drum.~~ Further, located on the outer circumferential side of the clutch drum ~~shaped member~~ 25 is ~~configured~~ a multi-disc brake B1 that comprises a hydraulic ~~oil pressure~~ servo 14 and friction plates 74.

The oil chamber of ~~this oil pressure~~ hydraulic servo 12 is connected to an oil line 2b which is formed on the ~~above~~ ~~mentioned~~ input shaft 2, and this oil line 2b ~~is provided along the edge of the case 3 that is the opposite side of that of the above mentioned boss unit 3a, and~~ is connected to the oil line 93 of the boss ~~unit~~ 3b which is ~~provided on~~ formed as a sleeve around the end of the input shaft 2, ~~in a sleeve form~~. Therefore, ~~an~~ oil ~~line~~ communication from the oil pressure control unit, ~~not illustrated,~~ to the oil chamber of the hydraulic ~~oil pressure~~ servo 12 is ~~constructed~~ connected on the ~~above mentioned oil pressure servo 12,~~ simply by providing one set of seal rings 82 ~~to seal~~ between the boss ~~unit~~ 3a ~~of the case 3~~ and the input shaft 2.

Further, the oil chamber of the ~~above mentioned oil~~ hydraulic ~~pressure~~ servo 13 is connected to an oil line 94 ~~of~~ in the ~~above mentioned~~ boss ~~unit~~ 3b, ~~and this~~ which oil line 94 is connected to ~~an~~ the oil pressure control unit, ~~not illustrated.~~

7th Embodiment

~~In other words, for the above-mentioned oil pressure servo 13, an oil line from the oil pressure control unit, not illustrated, to the oil chamber of the oil pressure servo 13 is constructed,~~ providing by one set of seal rings 84 to form a seal between the boss ~~unit~~ 3b ~~of the case 3~~ and the clutch ~~drum shaped member~~ 25.

~~Further, the above-mentioned~~ The input shaft 2 is connected to the ~~above-mentioned~~ clutch ~~drum shaped member~~ 23 ~~on~~ at the left side of the diagram, and ~~on~~ the inner circumferential surface ~~side~~ of this clutch ~~drum shaped member~~ 23 is ~~configured~~ splined to the friction plates 72 of the clutch C2, which ~~is capable of engaging by the oil pressure servo 12 for the clutch C2, splined, and is connected wherein the inner circumference side of the friction plate 72 of this clutch C2 is~~ are intermeshed with friction plates splined to the hub unit 24. ~~Further, this hub unit 24~~ which is connected to the ~~above-mentioned~~ carrier CR2.

~~Further,~~ The above-mentioned clutch ~~drum shaped member~~ 25 is rotatably supported by the ~~above-mentioned~~ boss ~~unit~~ 3b ~~so as to rotate~~, and ~~on~~ the outer circumferential surface ~~side of the front edge~~ of ~~this~~ clutch ~~drum shaped member~~ 25 is ~~configured~~ splined to the friction plates 74 of the brake B1 which is ~~capable of retaining~~ engaged/disengaged by operation of the ~~oil pressure~~ hydraulic servo 14, ~~for the above-mentioned brake B1, splined. On~~ the inner circumferential surface ~~side~~ of the front portion of ~~edge~~ of ~~this~~ clutch ~~drum shaped member~~ 25 is ~~configured~~ splined to the friction plates 73 of the clutch C3 which is ~~capable of engaging~~ engaged/disengaged by operation of the ~~oil pressure~~ hydraulic servo 13 for the

clutch C3, ~~splined, and on the inner circumference side of~~ friction plates are intermeshed with & splined to the friction plates 73 of this clutch C3 the ring gear R1, ~~is splined.~~

Further, carrier CR1 has a pinion Pa and a pinion Pb, ~~and this~~ pinion Pb meshes with the ~~above-mentioned~~ ring gear R1, and ~~this~~ pinion Pa meshes with ~~to~~ the sun gear S1 which ~~is~~ connected to the input shaft 2. This carrier CR1 is secured to the boss ~~unit~~ 3b ~~of the case 3~~ via a side plate, and this ring gear R1 is supported by a support ~~ring unit~~ element 26 rotatably extending to ~~to~~ the boss ~~unit~~ 3b, ~~so as to rotate.~~

Further, ~~to~~ the ~~above-mentioned~~ drum-shaped clutch member 25 is connected by a linking member 30 that transmits ~~the~~ rotation of the ring gear R1, when the clutch C3 is engaged, ~~and further, to the other side of this transmitting member 30 is connected~~ to the first sun gear S3 of the above-mentioned planetary gear unit PU.

The operations of the automatic transmission ~~device~~ 1$_9$ of this ~~based on the above construction,~~ ninth embodiment are similar to those of the first embodiment (see Fig. 2 and Fig. 3), and accordingly description thereof will not be repeated here ~~omitted.~~

As described above, ~~according to~~ in the automatic transmission ~~device~~ 1$_9$ ~~relating to the present invention,~~ of the ninth embodiment, because ~~due to~~ the second planetary gear unit PR and the clutch C2 ~~being configured~~ are located on one side ~~in the axial direction~~ of the first planetary gear unit PU, and the clutch C1 ~~being configured~~ is located

on the ~~other~~ axially opposite side ~~in the axial direction~~ of the first planetary gear unit PU, the second planetary gear unit PR and the first planetary gear unit PU can be ~~configured~~ located more closely together, as compared to ~~the case~~ an automatic transmission wherein, for example, two clutches C1 and C2 are ~~configured in~~ located between the planetary gear units PR and ~~planetary gear unit~~ PU, and the transmitting member 30 for transmitting the reduced speed rotation can be made relatively shortened. ~~By doing so~~ In this manner, the automatic transmission can be made more compact and more lightweight. Further, because the inertia (force of inertia) can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced. Further, compared to the case wherein three clutches C1, C2, C3 are ~~configured~~ located on one side of the planetary gear unit PU, the oil lines (for example, 2a, 2b, 91, 93, 94) that supply the ~~oil pressure~~ hydraulic servos 11, 12, and 13 of these clutches C1, C2, C3 can be more constructed easily, ~~and~~ the manufacturing process can be simplified and the costs ~~brought down~~ can be reduced.

Further, since the ~~oil pressure~~ hydraulic servos 11 and 12 are ~~provided~~ located on the input shaft 2, one set of seal rings 81 and 82 form an oil supply connection by providing a seal between the case 3 and ~~supply oil to the~~ oil lines 2a and 2b provided within input shaft 2, ~~and~~ therefore, oil can be supplied to the oil chamber of the hydraulic ~~oil pressure~~ servos 11 and 12 without providing ~~the~~ seal rings between, for example, the input shaft 2 and the ~~oil pressure~~ hydraulic servos 11 and 12.

Further, the ~~oil pressure~~ hydraulic servo 13 can ~~supply~~ receive oil directly from the boss ~~unit~~ 3a which is extended from the case 3, i.e without passing through other ~~parts for example~~ components, and therefore can be supplied oil by providing one set of seal rings 80. Therefore, the oil supply can be ~~supplied~~ connected simply by providing one set of seal rings 81 and 82, 84 each of the oil pressure servos 11, 12, and 13, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, because the clutch C2 is ~~configured on the inner circumference side~~ located radially inward of the clutch C3, the clutch C3, which must ~~transmit~~ bear a relatively large torque in ~~order to~~ transmit the reduced speed rotation, can be ~~configured on~~ located at the outer circumference ~~side~~, and therefore this clutch C3 and the oil pressure servo 13 thereof can have an increased diameter. In particular, the pressure receiving area of the oil chamber of the oil pressure servo 13 can be enlarged, and the ~~capacity capable of~~ torque transmitting capacity of this clutch C3 can be increased. By ~~configuring~~ designing the clutch C2 ~~which can~~ to have a smaller capacity ~~for~~ torque transmitting than ~~compared to~~ the clutch C3, the automatic transmission can be made more compact.

Further, the clutch C1 ~~is a clutch which~~ engages at the relatively slow to medium speed ~~levels~~ s of first speed forward, second speed forward, third speed forward, and fourth speed forward, and therefore when this clutch C1 is

released at the relatively high speed levels of fifth speed forward, sixth speed forward, or first speed reverse, ~~particularly~~ the hub unit 22 that connects ~~this~~ clutch C1 ~~and~~ the sun gear S2 rotates at a relatively high ~~revolution~~ speed or revolves in reverse (see Fig. 3). On the other hand, ~~at~~ in ~~the~~ fifth speed forward ~~or~~ 2nd first speed reverse the transmitting member 30 rotates at reduced ~~rotation~~ speed, and ~~at a~~ in sixth speed forward the transmitting member 30 may be fixed in some cases, and ~~difference in revolutions between~~ therefore the speed of the hub unit 22 ~~and~~ may differ from that of the transmitting member 30, ~~can occur.~~ However, because this clutch C1 is located on the ~~opposite~~ side of the first planetary gear unit PR ~~via~~ axially opposite the second planetary gear unit PU, the hub unit 22 and the transmitting member 30 can be ~~configured~~ spaced apart from one another to a transmission ~~with the case~~ wherein, for example, these members are in contact due to a multi-axial configuration, ~~decreased~~ a decrease in efficiency of the automatic transmission resulting from friction and so forth from the relative rotation of those units can be prevented.

Further, the automatic transmission ~~device~~ 1, ~~according~~ of ~~to~~ the ninth ~~present~~ embodiment ~~is a transmission device that~~ is directly coupled ~~at~~ in fourth speed forward. Therefore, ~~at~~ in fifth speed forward and sixth speed forward, the gear ratio can be ~~specified to~~ a high ratio, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine ~~revolutions~~ speed can be

lowered, ~~and this contributes to the quietness of~~ thus allowing the vehicle ~~while~~ to run more quietly at a high speed.

~~Now, the linking member (in particular~~ the transmitting member~~)~~ ~~for linking~~ which connects the second planetary gear unit PR and the first planetary gear unit PU requires rigidity to withstand the reduced speed torque ~~that is input~~ it transmits. For example, ~~in the case of configuring~~ a clutch that engages at a slow to medium speed ~~or~~ and a clutch that engages and disengages at a reduced ~~rotations~~ speed on the inner circumference side of the linking member~~,~~ ~~the clutches~~ must have a large capacity, and therefore, ~~an appropriate~~ must have a diameter to correspond ~~with~~ to this capacity. ~~becomes necessary.~~ Therefore, in the event that the ~~linking~~ transmitting member ~~member is the type that passes on the outer circumference side~~ passes radially outward of this type of clutch, even a larger diameter than the aforementioned necessary diameter is required ~~measurement of those clutches becomes necessary, and the diameter measurement of the linking member is enlarged more than necessary~~, and the automatic transmission as a whole ~~becomes greater in the direction of the~~ will have a larger diameter. Therefore an object of the present embodiment is to reduce the ~~enlargement of the~~ diameter ~~measurement~~, and to provide a more compact automatic transmission.

According to the present embodiment, ~~all clutches can be configured without enlarging~~ the enlargement of the diameter ~~measurement~~ of the ~~linking~~ transmitting member is avoided by ~~configuring~~ mounting a clutch C2 with a small capacity on the ~~linking member, particularly on the~~ radially inner

~~circumference~~ inward side of the transmitting member 30.

Tenth Embodiment

~~Now, the~~ tenth embodiment which is a partial modification of the ninth embodiment will be described with reference to Fig. 16. ~~Fig. 16 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the tenth embodiment. Now,~~ components of the tenth embodiment which are the same as those of the ninth embodiment ~~will be~~ are denoted ~~with~~ by the same reference numerals, and description thereof will be omitted, except for the partial modifications.

As Fig. 16 illustrates, the automatic transmission ~~device~~ 1_{10} of the ~~automatic transmission relating to the~~ tenth embodiment ~~is a modification of~~ has the configuration of the second planetary gear unit PR and the clutch C3, modified as compared to that of the automatic transmission ~~device 1_9 of the automatic transmission~~ of the first embodiment (see Fig. 15).

The clutch C3 is ~~configured~~ located on the ~~opposite~~ side of the second planetary gear unit PR (left side of diagram) of the opposite planetary gear unit PU ~~within this automatic transmission device 1_{10}~~. The inner circumferential surface ~~side~~ of ~~the~~ front portion ~~edge~~ of the ~~drum-shaped member~~ 25 of this clutch C3 is splined to the friction plates 73 which are intermeshed with ~~, and the inner circumferential side of this~~ friction plates 74 splined to the hub unit 26. The ~~drum-shaped member~~ 25 is connected to the input shaft 2, and the

hub unit 26 is connected to the sun gear S1. Further, the clutch C2, comprising a ~~oil pressure~~ hydraulic servo 12, a friction plate 72, a ~~drum-shaped member~~ 23, and a hub unit 24, is ~~configured on the inner circumference side~~ located radially inward of the ~~above-mentioned~~ clutch C3, that is to say, is ~~enclosed~~ located within the hub unit 26.

~~On the other hand,~~ on the outer circumference side of the first planetary gear unit PU is ~~configured~~ located a multi-disc brake B1 that comprises ~~an oil pressure~~ a hydraulic servo 14 and a friction plate 74. The side plate of the carrier CR1 of this second planetary gear unit PR is fixed to and supported by the case 3. Further, the ring gear R1 is connected to the transmitting member 30, and the friction plate 74 of the brake B1 ~~is~~ are splined ~~with~~ to the outer circumferential surface ~~side~~ of this transmitting member 30, ~~and this transmitting member 30~~ which is connected to the sun gear S3.

The operations of the automatic transmission ~~device~~ 1_{10}, ~~based on the above construction,~~ are similar to those of the third embodiment (see Fig. 6 and Fig. 7), and, accordingly, description thereof will not be repeated here ~~omitted~~.

As described above, according to the automatic transmission ~~device~~ 1_{10} ~~relating to the present invention~~ of the tenth embodiment, due to the second planetary gear unit PR and the clutch C2 being ~~configured~~ located on one side ~~in the axial direction~~ of the planetary gear unit PU, and the clutch C1 being ~~configured~~ located on the axially opposite

~~on the other side in the axial direction~~ of the first planetary gear units PU, the planetary gear PR and ~~the planetary gear unit~~ PU can be ~~configured~~ positioned more closely together, as compared to the case wherein for example two clutches C1 and C2 are ~~configured in~~ located between the second planetary gear unit PR and the first planetary gear unit PU, and the transmitting member 30 ~~for~~ which transmit~~ting~~ the reduced speed rotation can be made relatively shorte~~ned~~. ~~By doing so~~, In this manner the automatic transmission can be made more compact and more lightweight. Further, because the inertia (~~force of~~ inertia) can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced. Further, compared to the case wherein three clutches C1, C2, C3 are ~~configured~~ located on one side of the planetary gear unit PU, the oil lines (for example, 2a, 2b, 91, 93, 94) that supply the oil pressure servos 11, 12, and 13 of these clutches C1, C2, C3 can be constructed more easily, ~~and~~ the manufacturing process can be simplified and the costs ~~brought down~~ can be reduced.

Further, since the ~~oil pressure~~ hydraulic servos 11 and 12 are ~~provided~~ located on the input shaft 2, one set of seal rings 81 and 82 seal the case 3 and connect supply oil to the oil lines 2a and 2b provided within input shaft 2, and therefore oil can be supplied to the oil chambers of the hydraulic ~~oil pressure~~ servos 11 and 12 without providing ~~the~~ seal rings between, for example, the input shaft 2 and the ~~oil pressure~~ hydraulic servos 11 and 12.

Further, the ~~oil pressure~~ hydraulic servo 13 can receive oil directly from the boss ~~unit~~ 3b which extends from the case 3, without passing through other ~~parts for example~~ components, and therefore ~~can~~ the oil can be connected supply oil by providing one set of seal rings 84. Therefore, oil can be supplied simply by providing one set of seal rings 81 and 82, 84 each for the ~~oil pressure~~ hydraulic servos 11, 12, and 13, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, the clutch C1 ~~is a clutch which~~ engages in the relatively slow to medium speed ~~levels~~ of first speed forward, second speed forward, third speed forward, and fourth speed forward, and therefore when this clutch C1 is released at the relatively high speed ~~levels~~ of fifth speed forward, sixth speed forward, or first speed reverse, in particular, the hub unit 22 that connects this clutch C1 and the sun gear S2 rotates at a relatively high ~~revolution~~ speed or ~~revolves~~ in reverse (see Fig. 7). On the other hand, ~~at~~ in the fifth speed forward or first speed reverse the transmitting member 30 rotates at the reduced ~~rotation~~ speed, and ~~at a~~ in sixth speed forward the transmitting member 30 may be fixed in some cases, and difference in ~~revolutions~~ speed is between the hub unit 22 and the transmitting member 30 can occur. However, because this clutch C1 is located on the ~~opposite~~ side of the first planetary gear unit ~~PR via~~ PU, the axially opposite second planetary gear unit PR, the

hub unit 22 and the transmitting member 30 can be ~~configured~~ spaced apart from one another. In comparison with the case wherein, for example, these members are ~~in~~ contact due to a multi-axial configuration, decreased in efficiency of the automatic transmission resulting from friction and so forth from the relative rotation of those units can be prevented.

~~Further, in the event that~~ If the clutch C3 is placed between the ring gear R1 and the sun gear S3, for example, the reduced speed rotation must be engaged and disengaged, and consequently the clutch C3 must be ~~becomes~~ relatively large, but by placing clutch C3 between the input shaft 2 and the sun gear S1, the engaging and disengaging of the rotation of the input shaft 2 ~~from~~ by this clutch C3 indirectly causes the reduced speed rotation output from the ring gear R1 of the planetary gear PR to be engaged and disengaged, and the clutch C3 can be made more compact, and therefore the automatic transmission can be made more compact.

Further, the automatic transmission ~~device~~ 1_{10} ~~according to the present~~ of This Tenth embodiment is ~~a transmission device that is~~ directly coupled ~~at~~ in fourth speed forward. Therefore, ~~at~~ in fifth speed forward and sixth speed forward, the gear ratio can be ~~specified to~~ a high ratio, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine ~~revolutions~~ speed can be lowered, ~~and this contributes to the quietness of~~ thus allowing the vehicle ~~while~~ to run more quietly at a high speed.

~~Now, in the event that~~ When a clutch is ~~configured in~~ located between the ~~planetary gear~~ second PR unit and the ~~planetary gear unit~~ first PU for example, the length of the ~~linking member (particularly the~~ transmitting member 4 that links the ~~planetary gear~~ second PR unit and the ~~planetary gear unit~~ first PU ~~becomes longer in the~~ is axially elongated ~~direction~~, and since ~~this linking member is for~~ it transmitting the reduced ~~rotation~~ speed, the thickness of the member must be increased so as to withstand ~~this~~ the torque, and therefore ~~the~~ its weight is also increased. Therefore an object of the present invention is to provide an automatic transmission that can shorten the distance between the speed reducing second ~~ion~~ planetary gear unit and the first planetary gear unit, and thereby reduce the ~~increase in~~ weight. ~~weight.~~

With the tenth ~~present~~ embodiment, in particular, the clutch C2 is disposed on the ~~opposite~~ side ~~in the axial direction~~ of the second planetary gear unit PR axially opposite ~~PU from~~ the first planetary gear unit PU, and, therefore, ~~providing~~ provision of a clutch between the second planetary gear PR and the first planetary gear unit PU is not necessary, and the length of the ~~linking member, particularly the~~ transmitting member 30 can be made that much shorter. Therefore, ~~an increase in~~ weight of the automatic transmission as a whole can be reduced ~~prevented~~.

Eleventh Embodiment

~~Now,~~ The eleventh embodiment is a modification as ~~partially changed from~~ the ninth embodiment and will be described with reference to Fig.

17. ~~Fig. 17 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the eleventh embodiment.~~ ~~Now,~~ Components of the eleventh embodiment which are the same as those of the ninth embodiment ~~will be~~ are denoted ~~with~~ by the same reference numerals, and description thereof ~~will be~~ omitted, except for the partial modifications.

As Fig. 17 illustrates, the automatic transmission ~~device~~ 1_{11} of the ~~automatic transmission relating to the~~ eleventh embodiment ~~is~~ has a ~~modification of the~~ modified configuration of the clutch C2, and further, ~~configures~~ has a brake B3 instead of a clutch C3, and thereby enables the carrier CR1 of the planetary gear PR to be fixed by the brake B3, ~~compared to that of~~ in which respects it differs from the automatic transmission ~~device~~ 1_9 ~~of the automatic transmission~~ of the ninth embodiment (see Fig. 15).

Within the automatic transmission ~~device~~ 1_{11}, the brake B3 is ~~configured~~ located on the side of second unit planetary gear PR ~~on the~~ opposite (left side of the diagram) ~~from~~ the first planetary gear unit PU. This brake B3 comprises ~~an oil pressure~~ a hydraulic servo 16, a friction plate 76, and a hub unit 33. Further, the clutch C2, comprising ~~an oil pressure~~ a hydraulic servo 12, a friction plate 72, a drum ~~shaped member~~ 23, and a hub unit 24, is ~~configured~~ located on the ~~inner circumference~~ radially inward side of ~~above-mentioned~~ the brake B3, that is to say, it is ~~enclosed~~ positioned within the hub unit 33. The hub unit 33 of this brake B3 is connected to ~~the~~ one side plate of

intermeshed with friction plates

other
None side of the carrier CR1, and the side plate ~~of the other side~~ of this carrier CR1 is rotatably supported by the input shaft 2 ~~so as to be capable of rotating.~~ Further, the sun gear S1 is connected to the input shaft 2 via the drum ~~shaped member~~ 23 of the clutch C2. Also, the friction plates 74 of the brake B1 are splined to the outer circumferential surface of the ring gear R1, and this ring gear R1 is connected to the ~~transmitting member 30, and is connected to the~~ sun gear S3 via this transmitting member 30.

The operations of the automatic transmission ~~device~~ 1_{11}, of this eleventh embodiment ~~based on the above construction,~~ are similar to those of the fourth embodiment (see Fig. 9 and Fig. 10), and accordingly description thereof will not be repeated here ~~omitted~~.

As described above, ~~according to~~ the automatic transmission ~~device~~ 1_{11} of the eleventh embodiment ~~relating to the present invention~~, due to the second planetary gear unit PR and the clutch C2 being located ~~configured~~ on one side ~~in the axial direction~~ of the first planetary gear unit PU, and the clutch C1 being located ~~configured~~ on the ~~other side in the~~ axial opposite side direction of the first planetary gear unit PU, the second planetary gear units PR and ~~the planetary gear unit~~ PU can be located more ~~configured~~ closely together, as compared to the case wherein, for example, two clutches C1 and C2 are ~~configured in~~ located between the planetary gear units PR and ~~planetary gear unit~~ PU, and the transmitting member 30 for transmitting reduced speed rotation can be made relatively shorter ~~ned~~.

By doing so, the automatic transmission can be made more compact and more lightweight. Further, because the inertia force ~~of~~ inertia can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced.

Further, since the ~~oil pressure~~ hydraulic servos 11 and 12 are provided on the input shaft 2, the seal rings 81 and 82 seal the case 3 ~~and supply oil~~ to the oil lines 2a and 2b provided within input shaft 2, and therefore oil can be supplied to the oil chambers of ~~oil pressure~~ hydraulic servos 11 and 12 without providing the seal rings between, for example, the input shaft 2 and the ~~oil pressure~~ hydraulic servos 11 and 12. Therefore, oil can be supplied simply by providing the seal rings 81 and 82 each for the oil pressure servos 11 and 12, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

~~Further,~~ Because the clutch C1 ~~is a clutch which~~ engages at the relatively slow to medium speeds ~~levels~~ of first speed forward, second speed forward, third speed forward, and fourth speed forward, ~~and therefore~~ when this clutch C1 is released at the relatively high speeds ~~levels~~ of fifth speed forward, sixth speed forward, or first speed reverse, in particular, the hub unit 22, that connects this clutch C1 and the sun gear S2, rotates at a relatively high ~~revolution~~ speed

or ~~reversely~~ in reverse (see Fig. 10). On the other hand, ~~at~~ in ~~the~~ fifth speed forward or first speed reverse the transmitting member 30 is the reduced rotation speed, and ~~in a~~ sixth speed forward the transmitting member 30 may be fixed in some cases, and therefore there will be a difference in ~~revolutions~~ speeds between the hub unit 22 and the transmitting member 30 ~~can occur.~~ However, because this clutch C1 is located axially ~~on the~~ opposite ~~side of~~ the second planetary gear unit PR relative to ~~via~~ the first planetary gear unit PU, the hub unit 22 and the transmitting member 30 can be spaced ~~configured~~ apart from one another. In comparison with the case wherein, for example, these members are in contact due to a multi-axial configuration, a loss in ~~decreased~~ efficiency of the automatic transmission resulting from friction and so forth from the relative rotation of those units can be prevented.

Further, since the reduced speed rotation output to the second planetary gear unit PR from the first planetary gear unit PU is ~~made to be engaged and disengaged~~ controlled by the brake B3, the number of parts (for example drum-shaped members and so forth) can be reduced as compared to ~~the~~ a case wherein, for example, a clutch C3 is provided. Further, the brake B3 can ~~configure~~ connect an oil line directly ~~from~~ with in the case 3, and therefore the configuration of the oil line can be simplified as compared to the case wherein, for example, a clutch C3 is provided.

Further, the automatic transmission ~~device~~ 1_{11} according to ~~the present~~ this eleventh embodiment is ~~a transmission device that is~~

directly coupled ~~at~~ in fourth speed forward. Therefore, ~~at~~ in fifth speed forward and sixth speed forward, the gear ratio can be ~~specified to~~ a high ratio, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine ~~revolutions~~ speed can be lowered, and this ~~contributes to the quietness of~~ allows the vehicle ~~while~~ to run more quietly at a high speed.

~~Now, in the event that~~ When a clutch is ~~configured in~~ located between the ~~planetary gear~~ second unit PR and the ~~planetary gear unit~~ first unit PU for example, the length of the ~~linking member (particularly the~~ transmitting member that links the planetary gear units PR and ~~the planetary gear unit~~ PU ~~becomes longer in the~~ must be elongated axially ~~direction~~, and since this ~~linking member is for~~ transmitting ~~the~~ transmits reduced speed rotation, ~~the~~ its thickness ~~of the member~~ must be increased so as to withstand this load, and therefore ~~the~~ its weight is also increased. Therefore an object of the present invention is to provide an automatic transmission that can shorten the distance between the speed reduction ~~in~~ second planetary gear unit and the first planetary gear unit, and reduce the ~~increase in~~ weight.

With the ~~present~~ eleventh embodiment, in particular, the clutch C2 is disposed ~~on the~~ axially opposite ~~side in the axial direction of~~ relative to the first planetary gear unit PU ~~from~~ the second planetary gear unit PR, and therefore, providing a clutch between the planetary gear units PR and ~~the planetary gear unit~~ PU is not necessary, and the

length of the ~~linking member, particularly the~~ transmitting member 30 can be made that much shorter. Therefore, ~~an increase in~~ weight of the automatic transmission as a whole can be ~~prevented~~ reduced.

~~Twelfth~~ Twelfth Embodiment

~~Below, the~~ A twelfth embodiment, which is a partial modification of the first embodiment, will now be described with reference to Fig. 18. ~~Fig. 18 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the twelfth embodiment. New~~, Components of the twelfth embodiment which are the same as those of the first embodiment ~~will be~~ are denoted ~~with~~ by the same reference numerals, and description thereof omitted, except for partial modifications.

As Fig. 18 illustrates, the automatic transmission ~~device~~ 1_{12} of the automatic transmission ~~relating to~~ of the twelfth embodiment ~~configures~~ has the second planetary gear unit PR, the clutch C3, and the brake B1 ~~are configured on the~~ located axially opposite ~~side of~~ relative to the counter gear 5 ~~of~~ the first planetary gear unit PU (left side in the drawing), ~~compared to that of the~~ and in this respect differs from the automatic transmission ~~device~~ 1_1 ~~of the automatic transmission~~ of the first embodiment (see Fig. 1).

Within the automatic transmission ~~device~~ 1_{12}, on the ~~above-mentioned~~ input shaft 2 is ~~configured~~ mounted a multi-disc clutch C2, which comprises ~~an oil pressure~~ a hydraulic servo 12,

friction plates 72, a drum-shaped member 23 that forms a clutch drum, and a hub unit 24 linked to a sun gear S2 on the inner circumference side.

The oil chamber of this oil pressure servo 12 is connected to an oil line 2a which is formed on the above-mentioned input shaft 2, and this oil line 2a is provided along one edge of the case 3, and is connected to the oil line 91 of the boss unit 3a, which is provided on the input shaft 2 in a sleeve form. Further, this oil line 91 is connected to an oil pressure control unit, not illustrated. In other words, because the above-mentioned oil pressure servo 12 is configured on input shaft 2, an oil line from the oil pressure control unit, not illustrated, to the oil chamber of the oil pressure servo 12 is configured simply by providing one set of seal rings 81 to seal between the boss unit 3a of the case 3 and the input shaft 2.

The above-mentioned input shaft 2 is connected to the above-mentioned drum-shaped member 23, and on the inner circumference side of this drum-shaped member 23 is configured the friction plates 72 of the clutch C2 which is capable of engaging by the oil pressure servo 12, for the clutch C2, splined, and is connected wherein the inner circumference side of the friction plates 72 of this clutch C2 is splined to the hub unit 24. Further, this hub unit 24 is connected to the above-mentioned carrier CR2.

~~On the other hand, on~~ At the other ~~side~~ end of the input shaft 2 (left ~~end~~ in diagram) is ~~configured~~ a multi-disc clutch C1 ~~that has an oil pressure~~ operated by a hydraulic servo 11, ~~and~~ including friction plate ~~s~~ 71, a ~~drum-shaped member 21 that forms a~~ clutch drum 21, and a hub unit 22 linked to a sun gear S2. ~~On~~ Adjacent the outer circumference ~~side~~ is ~~configured~~ a multi-disc clutch C3 ~~that comprises an oil pressure~~ operated by a hydraulic servo 13, ~~and~~ including ~~a~~ friction plate ~~s~~ 73, and a drum ~~unit~~ clutch 25 ~~that forms a clutch drum.~~ Further, ~~on the outer circumference side~~ radially outward of the drum ~~shaped member~~ clutch 25 is ~~configured~~ a multi-disc brake B1 that comprises ~~an oil pressure~~ a hydraulic servo 14 and ~~a~~ friction plate ~~s~~ 74.

The oil chamber of this ~~oil pressure~~ hydraulic servo 11 is connected to an oil line 2b which is formed ~~on~~ in the above-mentioned input shaft 2, and this oil line 2b is provided along the edge of the case 3 that is the opposite ~~side of~~ ~~that of~~ the above-mentioned boss unit 3a, and is connected to the oil line 93 of the boss ~~unit~~ 3b which is ~~provided on~~ formed as a sleeve around one end as the input shaft 2 ~~in a sleeve form~~. Therefore, ~~an~~ oil ~~line~~ Pressure communication between ~~from~~ the oil pressure control unit, ~~not illustrated, to~~ the oil chamber of the ~~oil pressure~~ hydraulic servo 11 is ~~constructed on the above-mentioned oil pressure servo 11, simply by~~ provided by ~~providing~~ one set of seal rings 82 which form a seal between the boss unit 3b ~~of the case 3~~ and the input shaft 2.

~~Further,~~ The oil chamber of the ~~above-mentioned oil pressure~~ hydraulic servo 13 is connected to an oil line 94 ~~of~~ in the

~~above mentioned~~ boss ~~unit~~ 3b, ~~and this oil line 94~~ is which 2/80 connected to ~~an~~ the oil pressure control unit, ~~not illustrated.~~ ~~In other words~~, for the ~~above mentioned~~ oil pressure servo 13, ~~an~~ oil ~~line from~~ the oil pressure control unit, ~~not illustrated,~~ ~~to~~ and the oil chamber of the oil pressure servo 13 is ~~constructed~~ established by one set of seal rings 84 ~~to~~ which provide a seal between the boss ~~unit~~ 3b ~~of the case 3~~ and the ~~drum-shaped member~~ clutch 25.

Further, the ~~above-mentioned~~ input shaft 2 is connected to the ~~above-mentioned~~ ~~drum-shaped~~ clutch member 21 on the left side of the diagram, and ~~on the inner circumference side~~ located radially outward of this ~~drum-shaped member~~ clutch 21 ~~is configured~~ are the friction plates 71 of the clutch C1 which is ~~capable of engaging~~ operated by the ~~oil pressure~~ hydraulic servo 11. ~~for the clutch C1,~~ Friction plates 71 are splined, ~~and is connected wherein the inner circumference side of the friction plates 71 of this clutch C1 is~~ to the clutch drum 21 and are intermeshed with splined to the hub unit 22. ~~Further, this hub unit 22~~ which is connected to the ~~above-mentioned~~ sun gear S2.

~~Further,~~ the ~~above-mentioned~~ ~~drum-shaped member~~ clutch 25 is rotatably supported by the ~~above mentioned~~ boss ~~unit~~ 3b ~~so as to rotate,~~ and ~~on the~~ its outer circumferential surface, are portion thereof ~~is splined to the edge of this drum-shaped member 25 is configured the~~ friction plates 74 of the brake B1 which is ~~capable of retaining~~ operated by the ~~oil pressure~~ hydraulic servo 14 ~~for the above-mentioned brake B1, splined. On~~ the inner circumferential surface portion of the front ~~edge~~ side of this ~~drum-shaped member~~ clutch 25 is

splined to
~~configured~~ the friction plate 73 of the clutch C3 which is
~~capable of engaging~~ operated by the ~~oil pressure~~ hydraulic servo 13. ~~for the~~
~~clutch C3, splined, and on the inner circumference side of~~
the friction plate 73 of this clutch C3 are intermeshed with friction plates splined to the ring gear R1, ~~is splined.~~

~~Further,~~ The carrier CR1 ~~has a pinion Pa and~~ supports a pinion Pb, ~~and this pinion Pb~~ which meshes with the ~~above-mentioned~~ ring gear R1, and ~~this~~ a pinion Pa which meshes with the sun gear S1 which, in turn, is connected to the input shaft 2. ~~This~~ The carrier CR1 is secured to the boss ~~unit~~ 3b ~~of the case 3~~ via a side plate, and ~~this~~ ring gear R1 is rotatably supported by a supporting ~~unit~~ element 26 extending from ~~to~~ the boss ~~unit~~ 3b, ~~so as to rotate.~~

Further, ~~to~~ the ~~above-mentioned~~ drum-shaped ~~member~~ clutch 25 is connected to one end of a ~~linking~~ transmitting member 30 that transmits the rotation of the ring gear R1 when the clutch C3 is engaged, ~~and further, to~~ the opposite end ~~other side~~ of this transmitting member 30 is connected the sun gear S3 of the ~~above-mentioned~~ first planetary gear unit PU.

The operations of the automatic transmission ~~device~~ 1_{12}, ~~based on the above construction,~~ of this twelfth embodiment are similar to those of the first embodiment (see Fig. 2 and Fig. 3), and accordingly description thereof will not be repeated here ~~omitted.~~

As described above, according to the automatic transmission ~~device~~ 1_{12} ~~relating to the present invention,~~ of the twelfth embodiment, ~~due to~~ because the planetary gear PR and the clutch C1 ~~being~~

~~configured~~ located on one side ~~in the axial direction~~ of the planetary gear unit PU, and the clutch C2 ~~being configured~~ is located on the ~~other~~ axially opposite side ~~in the axial direction~~ of the planetary gear unit PU, the planetary gear units PR and ~~the planetary gear unit~~ PU can be ~~configured~~ located more closely together, as compared to the case wherein, for example, two clutches C1 and C2 are ~~configured in~~ located between the planetary gear units PR and ~~planetary gear unit~~ PU, and the transmitting member 30 for transmitting the reduced speed rotation can be made relatively shorter~~ned~~. ~~By doing so,~~ and the automatic transmission can be made more compact and ~~more~~ lightweight. Further, because the inertia (~~force of~~ inertia) can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced. Further, compared to the case wherein three clutches C1, C2, C3 are ~~configured~~ located on one side of the planetary gear unit PU, the oil lines (for example, 2a, 2b, 91, 93, 94) that supply the ~~oil pressure~~ hydraulic servos 11, 12, and 13 ~~of these clutches C1, C2, C3~~ can be constructed more easily, ~~and~~ the manufacturing process can be simplified and the costs ~~brought down~~ can be reduced.

Further, since the ~~oil pressure~~ hydraulic servos 11 and 12 are ~~provided~~ mounted on the input shaft 2, one set of seal rings 81 and 82 ~~seal~~ provide a seal between the case 3 ~~and supply oil to the~~ oil lines 2a and 2b provided within input shaft 2, and therefore oil can be supplied to the oil chamber of oil pressure servos 11 and 12

without providing ~~the~~ seal rings between, for example, the input shaft 2 and the ~~oil pressure~~ hydraulic servos 11 and 12. Further, the ~~oil pressure~~ hydraulic servo 13 can receive oil directly from the boss ~~unit~~ 3a which extended from the case 3, i.e. without passing through other ~~parts for example, and therefore can supply oil~~ components, by providing one set of seal rings 80. Therefore, oil can be supplied secured simply by providing one set of seal rings 81 and 82, 84 each for the ~~oil pressure~~ hydraulic servos 11, 12, and 13, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, due to the clutch ~~C1~~ C3 being ~~configured on the inner circumference side~~ arranged radially outward of the clutch ~~C3~~ C1, the clutch C3, which must transmit a relatively large torque ~~in order to~~ with transmission of the reduced speed rotation, ~~can be configured on the outer circumference side, and this clutch C3 and the oil~~ and its hydraulic ~~pressure~~ servo 13 ~~thereof~~ can have an increased diameter, ~~Particularly~~ the pressure receiving area of the oil chamber of the ~~oil~~ hydraulic ~~pressure~~ servo 13 can be enlarged, and the ~~capacity capable~~ ~~of~~ torque transmission capacity of ~~this~~ clutch C3 can be increased. ~~By configuring~~ Further, by providing the clutch C1 ~~which can have~~ with a smaller capacity ~~for~~ torque transmission compared to as that of the clutch C3, the automatic transmission can be made more compact.

Further, because the automatic transmission ~~device~~ 1_{12} ~~according to~~ of the ~~present~~ twelfth embodiment is ~~a transmission device that is~~

directly coupled ~~at~~ in fourth speed forward, ~~Therefore, at~~ in fifth speed forward and in sixth speed forward, the gear ratio can be ~~specified to~~ a high ratio, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine ~~revolutions~~ speed can be lowered, ~~and this contributes to the quietness of the~~ thus allowing the vehicle ~~while~~ to more quietly running at a high speed.

~~Thirteenth Embodiment~~

~~Below, the~~ A thirteenth embodiment, which is a partial modification of the twelfth embodiment, will now be described with reference to Fig. 19. ~~Fig. 19 is a schematic cross sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the thirteenth embodiment. Now~~, Components of the thirteenth embodiment which are the same as those of the twelfth embodiment ~~will be~~ are denoted ~~with~~ by the same reference numerals, and description thereof omitted, except for the partial modifications.

As Fig. 19 illustrates, the automatic transmission ~~device~~ 1_{13} of the ~~automatic transmission relating to the~~ thirteenth embodiment ~~is a modification of~~ has the configuration of the planetary gear unit PR, the clutch C1, and the clutch ~~C1~~ C3 modified ~~compared to that of the automatic transmission device 1_{12} of the automatic transmission of the~~ relative to the twelfth embodiment (see Fig. 18).

In this thirteenth embodiment

The clutch C1 and ~~the clutch~~ C3 ~~is configured~~ are located on the side of the second planetary gear unit ~~PR side~~ PR (left side of diagram) opposite of the first planetary gear ~~PR within this automatic transmission device~~ PU 13. The inner ~~circumference side~~ surface of ~~the~~ a front ~~edge~~ portion of the drum~~-shaped member~~ 25 of this clutch C3 is splined to the friction plate~~s~~ 73 which are intermeshed with ~~, and the inner circumference side of this~~ friction plate~~s~~ ~~73 is~~ splined to the hub unit 26. The drum~~-shaped member~~ clutch 25 is connected to the input shaft 2, and the hub unit 26 is connected to the sun gear S1. Further, the clutch C1 comprising a ~~oil pressure~~ hydraulic servo 12, ~~a~~ friction plate~~s~~ 71, a drum~~-shaped member~~ clutch 21, and a hub unit 22 is ~~configured on the inner circumference side~~ located radially inward of the ~~above-mentioned~~ clutch C3, that is to say, is enclosed within the hub unit 26.

~~On the other hand, on the outer circumference side of~~ Radially outward of the second planetary gear unit PR is ~~configured~~ a multi-disc brake B1 that comprises ~~an oil pressure~~ a hydraulic servo 14 and ~~a~~ friction plate~~s~~ 74. The side plate of the carrier CR1 of ~~this~~ the second planetary gear unit PR is fixed to and supported by the case 3. Further, the ring gear R1 is connected to the transmitting member 30, and the friction plate~~s~~ 74 of the brake B1 ~~is~~ are splined ~~with~~ to the outer circumferen~~ce~~tial surface ~~side~~ of ~~this~~ transmitting member 30, ~~and this transmitting member 30~~ which, in turn is connected to the sun gear S3.

The operations of the automatic transmission ~~device~~ Fig. 13 ~~based on the above construction,~~ are similar to those of the

third embodiment (see Fig. 6 and Fig. 7) and accordingly description thereof will not be repeated here.

As described above, in the automatic transmission 1_{13} of the Thirteenth embodiment, because second planetary gear unit PR and the clutch C1 are located on one side of the first planetary gear unit PU, and the clutch C2 is located on the axially opposite side of the first planetary gear units PR and PU can be located more closely together, compared to a Transmission wherein, for example, two clutches C1 and C2 are located between the planetary gear units PR and PU, and the transmitting member 30 for transmitting reduced speed rotation can be made relatively shorter. By doing so, the automatic transmission can be made more compact and more lightweight. Further, because the inertia (force of inertia) can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced. Further, compared to the case wherein three clutches C1, C2, C3 are located on one side of the first planetary gear unit PU, the oil lines (for example, 2a, 2b, 91, 93, 94) that supply the hydraulic servos 11, 12, and 13 of these clutches C1, C2, C3 can be more easily constructed, and the manufacturing process can be simplified and the costs can be reduced.

Further, since the ~~oil pressure~~ hydraulic servos 11 and 12 are ~~provided~~ mounted on the input shaft 2, one set of seal rings 81 and 82 serve to seal the case 3 and supply oil to the oil lines 2a and 2b provided within input shaft 2, ~~and therefore~~ thus oil can be supplied to the oil chambers of ~~oil pressure~~ hydraulic servos 11 and 12 without providing ~~the~~ seal rings between, for example, the input shaft 2 and the ~~oil pressure~~ hydraulic servos 11 and 12. Further, the ~~oil pressure~~ hydraulic servo 13 can be supplied with ~~supply~~ oil from the boss unit 3b extended from the case 3, without passing through other ~~parts for example, and therefore can supply oil~~ components by providing one set of seal rings 84. ~~Therefore,~~ Because oil can be supplied ~~simply~~ by providing one set of seal rings 81 and 82, 84 each for the ~~oil pressure~~ hydraulic servos 11, 12, and 13, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, because the clutch C1 is ~~configured on the inner circumference side~~ located radially inward of the clutch C3, the clutch C3, which must transmit a relatively large torque in order to transmit the reduced speed rotation, can be ~~configured~~ located on the outer circumference side, and ~~this~~ therefore clutch C3 and the oil pressure servo 13 thereof can have an increased diameter. In particular, the pressure-receiving area of the oil chamber of the oil pressure servo 13 can be enlarged, and the ~~capacity capable of~~ capacity of torque transmission of ~~this~~ clutch C3 can be increased.

Further, by designing ~~By configuring~~ the clutch C1 ~~which can~~ to have a smaller capacity ~~for~~ torque transmission as compared to the clutch C3, the automatic transmission can be made more compact.

In contrast ~~Further~~, for example, if the clutch C3 ~~is~~ were to be placed between the ring gear R1 and the sun gear S3, the reduced speed rotation speed, high torque ~~would~~ ~~must be~~ engaged and disengaged, and ~~becomes~~ would need to be relatively large, ~~but by placing~~ However, by locating clutch C3 between the input shaft 2 and the sun gear S1, ~~the~~ engagement and disengagement of ~~the rotation of the input shaft 2 from~~ this clutch C3 indirectly causes the reduced speed rotation output from the ring gear R1 of the second planetary gear unit PR to be engaged and disengaged, and therefore the clutch C3 can be made more compact as a whole, and ~~therefore~~ the automatic transmission can be made more compact.

Further, the automatic transmission ~~device~~ 1_{13} ~~according to~~ of the ~~present~~ fourth embodiment is ~~a transmission device that is~~ directly coupled in fourth speed forward. Therefore, at fifth speed forward and sixth speed forward, the gear ratio can be ~~specified to~~ a high ratio, and, particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine ~~revolutions~~ speed can be lowered, thus allowing the ~~and this contributes to the quietness of the~~ vehicle ~~while~~ to run more quietly at a high speed.

~~Now, in the event that~~ If a clutch is ~~configured in~~ located between the planetary gear units PR and ~~the planetary gear unit~~ PU ~~for example~~, the length of the ~~linking member (particularly~~

~~the~~ transmitting member that links the planetary gear units PR and ~~the planetary gear unit~~ PU ~~becomes longer in the~~ must be axially elongated ~~direction~~, and since this ~~linking member is for~~ transmitting the reduced speed member receives rotation, the thickness of the member must be increased so as to withstand the high torque ~~this~~, and therefore the weight is also increased. Therefore an object of the present invention is to provide an automatic transmission that can shorten the distance between the ~~speed reduction~~ planetary gear ~~and the planetary gear~~ unit, and thereby prevent ~~reduce the~~ increase in weight.

~~With the present~~ In this thirteenth embodiment, ~~in particular,~~ because the clutch C1 is disposed on the ~~opposite~~ side ~~in the axial direction~~ of the planetary gear unit ~~PU from~~ PR axially opposite unit PU the planetary gear ~~PR~~, ~~and therefore~~, providing sign of a clutch between the planetary gear units PR and ~~the planetary gear unit~~ PU is not necessary, and the ~~length of the linking member, particularly the~~ transmitting member 30 can be made that much shorter. Therefore, an increase in weight of the automatic transmission as a whole can be ~~prevented~~ avoided.

~~Fourteenth Embodiment~~

~~Below, the~~ A fourteenth embodiment, which is a partial modification of the twelfth embodiment, will now be described with reference to Fig. 20. ~~Fig. 20 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the~~

~~fourteenth embodiment.~~ Now, Components of the fourteenth embodiment which are the same as those of the twelfth embodiment ~~will be~~ are denoted ~~with~~ by the same reference numerals, and description thereof omitted, except for partial modifications.

As Fig. 20 illustrates, the automatic transmission ~~device~~ 1_{14} ~~of the automatic transmission relating to~~ of the fourteenth embodiment differs from that of the twelfth embodiment ~~is a modification of~~ in the configuration of the clutch C2, ~~and further, configures~~ having a brake B3 instead of a clutch C3, and in it enables the carrier CR1 of the planetary gear PR to be fixed by the brake B3, ~~compared to that of the automatic transmission device 1_{12} of the automatic transmission of the twelfth embodiment (see Fig. 18)~~.

Within the automatic transmission ~~device~~ 1_{14}, the brake B3 is ~~configured~~ located on the side of the planetary gear unit PR, ~~on the~~ axially opposite (left side on the diagram) ~~from~~ the planetary gear unit PU. This brake B3 comprises ~~an oil pressure~~ a hydraulic servo 16, a friction plate 76, and a hub unit 33. ~~Further,~~ The clutch C1 is ~~comprising an oil pressure~~ a hydraulic servo 11, a friction plate 71, a clutch drum-shaped member 21, and a hub unit 22, and is located ~~configured on the inner circumference side~~ radially inward of the ~~above mentioned~~ brake B3, ~~that is to say, is~~ enclosed within the hub unit 33. The hub unit 33 of this brake B3 is connected to ~~the~~ one side plate of ~~one side of~~ the carrier CR1, and the other side plate of the ~~other side of this~~ carrier CR1 is rotatably supported by the input shaft 2.

~~so as to be capable of rotating.~~ Further, the sun gear S1 is connected to the input shaft 2 via the drum ~~shaped member~~ 21 of the clutch C1. ~~Also,~~ the friction plates 74 of the brake B1 ~~is~~ splined ~~with~~ the outer circumference ~~side~~ of the ring gear R1, and this ring gear R1 is connected to the ~~transmitting member 30, and is connected to the~~ sun gear S3 ~~via this~~ transmitting member 30.

The operations of the automatic transmission ~~device~~ 1_{14} ~~based on the above construction,~~ are similar to those of the fourth embodiment (see Fig. 9 and Fig. 10), and accordingly description thereof will ~~be omitted~~.

~~As described above, according to~~ the automatic transmission ~~device~~ 1_{14} ~~relating to the present invention,~~ due to the planetary gear PR and the clutch C1 being ~~configured~~ on one side ~~in the axial direction~~ of the planetary gear unit PU, and the clutch C2 being ~~configured on the other side in~~ the axial ~~direction~~ of the planetary gear unit PU, the planetary gear PR and ~~the planetary gear unit~~ PU can be ~~configured~~ closely together compared to ~~the case wherein~~ for example two clutches C1 and C2 are ~~configured in~~ between the planetary gear PR and ~~planetary gear unit~~ PU, and the transmitting member 30 for transmitting reduced rotation can be relatively ~~shortened~~. ~~By doing so~~, the automatic transmission can be made more compact and more lightweight. Further, because the inertia

force ~~of~~ inertia) can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced. Further, compared to ~~the case~~ a transmission wherein three clutches C1, C2, C3 are ~~configured~~ located on one side of the planetary gear unit PU, the oil lines (for example, 2a, 2b, 91, 93) that supply ~~the~~ oil to the ~~pressure~~ hydraulic servos 11 and 12 of these clutches C1 and C2, can be more constructed easily, ~~and~~ the manufacturing process can be simplified and the costs ~~brought down~~ can be reduced.

Further, since the ~~oil pressure~~ hydraulic servos 11 and 12 are provided on the input shaft 2, the seal rings 81 and 82 seal the case 3 ~~and supply oil~~ to the oil lines 2a and 2b provided within input shaft 2, and therefore oil can be supplied to the oil chamber of ~~oil pressure~~ hydraulic servos 11 and 12 without providing ~~the~~ seal rings between, for example, the input shaft 2 and the ~~oil pressure~~ hydraulic servos 11 and 12. Therefore, the oil supply can be ~~supplied~~ connected simply by providing the seal rings 81 and 82 each for the ~~oil pressure~~ hydraulic of servos 11 and 12, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, since the reduced rotation ~~output~~ speed output of to the ~~first~~ second planetary gear unit PU from the planetary gear unit PR is ~~made to be engaged and disengaged~~ controlled by the brake B3, the number of parts (for example drum, ~~hub~~ members ~~and so forth~~) can be

reduced as compared to ~~the case wherein, for example, a~~ embodiments having clutch C3 ~~is provided.~~ Further, the brake B3 can ~~configure~~ connect an oil line directly ~~from~~ to/in the case 3, and therefore the configuration of the oil line can be simplified as compared to the ~~case wherein, for example,~~ embodiments including a clutch C3 ~~is provided.~~

Further, the automatic transmission ~~device~~ 1_{14} ~~according to~~ of the ~~present~~ fourteenth embodiment is ~~a transmission device that is~~ directly coupled ~~at~~ in fourth speed forward. Therefore, ~~at~~ in fifth speed forward and sixth speed forward, the gear ratio can be ~~specified to~~ a high ratio, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine ~~revolutions~~ speed can be lowered, and ~~this contributes to the quietness of~~ thereby allowing the vehicle ~~while~~ to run more quietly at high speed.

~~Now, in the event that~~ If a clutch is ~~configured in~~ located between the planetary gear units PR and ~~the planetary gear unit~~ PU ~~for example~~, the length of ~~the linking member (particularly~~ the transmitting member 3 that links the planetary gear units PR and ~~the planetary gear unit~~ PU ~~becomes longer in the~~ must be elongated axially ~~direction~~, and ~~since~~ because this ~~linking~~ member ~~is for~~ transmitting the reduced speed rotation, ~~the~~ its thickness ~~of the member~~ must be increased so as to withstand ~~this~~ the transmitted torque, its weight ~~must~~ also be increased. Therefore an object of the present invention is to provide an automatic transmission that can ~~shorten~~ reduce the distance between the ~~speed reduction~~ planetary units PU and PR,

~~gear and the planetary gear unit~~, and ~~reduce the increase in~~ TO thereby minimize the weight of the transmitting member

~~With~~ In the fourteenth ~~present~~ embodiment, in particular, the clutch C1 is disposed on the ~~opposite~~ side ~~in the axial direction~~ of the second planetary gear unit ~~PU from~~ PR opposite the first planetary gear unit PU ~~PR~~, and therefore, providing a clutch between the planetary gear units PR and ~~the planetary gear unit~~ PU is not necessary, and the length of the ~~linking member, particularly the~~ transmitting member 30 can be made that much shorter. Therefore, ~~an increase in~~ weight of the automatic transmission as a whole can be reduced ~~prevented~~.

~~Fifteenth Embodiment~~

~~Below,~~ The fifteenth embodiment, which is a partial modification of the ~~first through fourteenth~~ previously described embodiments will now be described ~~in~~ with reference to Fig. 21 through Fig. 23. Fig. 21 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the fifteenth embodiment, Fig. 22 is an operational table of an automatic transmission relating to the fifteenth embodiment, and Fig. 23 is a speed line diagram of an automatic transmission relating to the fifteenth embodiment. ~~Now,~~ Components of the fifteenth embodiment which are the same as those of the first embodiment ~~will be~~ are denoted ~~with~~ by the same reference numerals, and description thereof ~~omitted~~ will not be repeated here, except for ~~partial~~

modifications.

As illustrated in Fig. 21, ~~an~~ the automatic transmission ~~device~~ 1_{15} of ~~an automatic transmission relating to~~ the fifteenth embodiment comprises a first planetary gear unit PU and a second planetary gear unit PR on the input shaft 2, similar to ~~that of an~~ the automatic transmission ~~device~~ 1_1 of ~~an automatic transmission relating to~~ the first embodiment. The first planetary gear unit PU comprises a first simple planetary gear unit SP2 and a second simple planetary unit SP3, and is a Simpson-type planetary gear unit comprising a sun gear S2 and a sun gear S3 that are linked together, a carrier CR3 and a ring gear R2 that are linked together, a ring gear R3, and a carrier CR2, as the four ~~rotation~~ rotary components. Further, the ~~above-mentioned~~ second planetary gear unit PR is a double pinion planetary gear unit comprising a carrier CR1, ~~wherein~~ a pinion P1b which is meshed with a ring gear R1 and a pinion P1a which is meshed with a sun gear S1, ~~which~~ wherein the pinions are meshed with one another.

Also on the ~~above-mentioned~~ input shaft 2 is ~~configured~~ mounted a multi-disc clutch C1, which comprises ~~an oil pressure~~ a hydraulic servo 11, a friction plate 71, a drum clutch ~~shaped member~~ 121 ~~that forms a clutch drum~~, and a hub unit 122. The oil chamber of this ~~oil pressure~~ hydraulic servo 11 is connected to an oil line 91 of the boss ~~unit~~ 3a which ~~is provided on~~ forms a sleeve around one end of the input shaft 2 ~~in a sleeve form and is provided along one edge of the case 3,~~ and this oil line 91 is connected to an oil pressure control

unit, not illustrated. In other words, an oil line from the oil pressure control unit, not illustrated, to the oil chamber of the oil pressure servo 11 is ~~configured~~ connected simply by providing one set of seal rings 81 which form a seal between the boss ~~mat~~ 3a ~~of the case 3~~ and the drum~~-shaped member~~ 121.

The ~~above-mentioned~~ input shaft 2 is connected to the ~~above-mentioned~~ clutch drum~~-shaped member~~ 121, and ~~on~~ the inner ~~circumference side~~ surface of this drum~~-shaped member~~ 121 is splined ~~configured~~ to the friction plates 71 of the clutch C1 which are intermeshed ~~capable of engaging by the oil pressure servo 11 for the clutch C1, splined, and is connected wherein the inner circumference side of the~~ with friction plates ~~71 of this clutch C1 is~~ splined to the hub unit 122 ~~. Further, this hub unit~~ which, in turn, ~~is~~ is connected to the ~~above-mentioned~~ sun gear S2.

~~On the other hand,~~ At the other end (the left of the diagram) of the input shaft 2 is ~~configured~~ a multi-disc clutch C2 which comprises ~~an oil pressure~~ a hydraulic servo 12, a friction plates 72, a clutch drum~~-shaped member~~ 123 ~~that forms a clutch drum~~, and a hub unit 124 ~~liked~~ linked to a carrier CR3. At the outer circumference ~~side,~~ is a multi-disc clutch C3 ~~is configured,~~ which comprises ~~an oil pressure~~ a hydraulic servo 13, a friction plates 73, and a clutch drum~~-shaped member~~ 125 ~~that forms a clutch drum.~~ Further, ~~on the outer circumference side~~ radially outward of the clutch drum~~-shaped member~~ 125 is ~~configured~~ a multi-disc brake B1 which comprises ~~an oil pressure~~ a hydraulic servo 14 and a friction

plate 74.

The oil chamber of this ~~oil pressure~~ hydraulic servo 12 is connected to an oil line 2b which is formed on the ~~above-mentioned~~ input shaft 2, and this oil line 2b ~~is provided~~ extends along the edge of the case 3 that is ~~the~~ opposite ~~side of that of~~ the above-mentioned boss ~~unit~~ 3a, and is connected to the oil line 93 of the boss ~~unit~~ 3b which is ~~provided on~~ forms a sleeve around the input shaft 2, ~~in a sleeve form~~. Therefore, an oil line from the oil pressure control unit, not illustrated, to the oil chamber of the ~~oil pressure~~ hydraulic servo 12, is ~~constructed on the above-mentioned oil pressure servo 12,~~ connected simply by providing one set of seal rings 82 to form a seal between the input shaft 2 and the ~~drum-shaped member~~ clutch 23.

Further, the oil chamber of the ~~above-mentioned oil pressure~~ hydraulic servo 13 is connected to an oil line 94 of the ~~above-mentioned~~ boss ~~unit~~ 3b, ~~and this~~ which oil line 94 is connected to ~~an~~ the oil pressure control unit, ~~not illustrated.~~ In other words, for the above-mentioned ~~oil pressure~~ hydraulic servo 13, an oil line from the oil pressure control unit ~~not illustrated,~~ to the oil chamber of the oil pressure servo 13 is ~~constructed~~ connected by one set of seal rings 84 ~~to seal~~ between the boss ~~unit~~ 3b ~~of the case 3~~ and the ~~drum-shaped member~~ clutch 125.

~~Further,~~ The ~~above-mentioned~~ input shaft 2 is connected to the ~~above-mentioned~~ drum-shaped member 123 on the left

side of the diagram, and ~~on~~ the inner ~~circumference side~~ surface of this drum-shaped member 123 is ~~configured~~ splined to the friction plates 72 of the clutch C2 which ~~is capable of engaging by the oil pressure~~ is operated by the hydraulic servo 12. ~~for the clutch C2, splined, and is connected wherein the inner circumference side of the~~ The friction plates 72 ~~of this clutch C2 is~~ are intermeshed with friction plates splined to the hub unit 124, ~~Further, this~~ which hub unit 124 is connected to the ~~above-mentioned~~ carrier CR3.

~~Further, the above mentioned~~ The clutch drum-shaped member 125 is rotatably supported by the ~~above-mentioned~~ boss ~~unit~~ 3b ~~so as to rotate~~, and ~~on~~ the outer ~~circumference side~~ surface of ~~the~~ a clutch drum-shaped member 125 is ~~configured the~~ splined to friction plates 74 of the brake B1 which is ~~capable of retaining by the oil pressure~~ operated by hydraulic servo 14. ~~for the above-mentioned brake B1, splined. On~~ The inner ~~circumference~~ surface side of the front ~~edge~~ portion of ~~this~~ drum-shaped member 125 is ~~configured~~ splined to the friction plates 73 of the clutch C3 which is ~~capable of engaging~~ operated by the ~~oil pressure~~ hydraulic servo 13 ~~for the clutch C3, splined, and on the inner circumference side of~~ The friction plates 73 ~~of this clutch C3~~ are intermeshed with friction plates splined to the ring gear R1, ~~is splined.~~

~~Further,~~ The carrier CR1 ~~comprises~~ supports a pinion P1a and a pinion P1b, ~~and this~~ pinion P1b meshes with the ~~above-mentioned~~ ring gear R1, and ~~this~~ pinion P1a meshes with the sun gear S1 which is connected to the input shaft 2. ~~This~~

Carrier CR1 is secured to the boss ~~unit~~ 3b of the case 3 via a side plate, and ~~this~~ ring gear R1 is supported by a supporting ~~unit~~ 126 to the boss ~~unit~~ 3b, ~~so as to rotate.~~

~~Further, to the above-mentioned~~ drum ~~shaped member~~ 125 is connected ~~a linking~~ member 130 that ~~transmits~~ the rotation of the ring gear R1 when the clutch C3 is engaged, and further, ~~to~~ the other ~~side~~ of this transmitting member 130 is connected the ring gear R3 of the second simple planetary gear SP3 of the ~~above mentioned~~ planetary gear unit PU.

~~On the other hand,~~ on the outer ~~circumference~~ side of the first simple planetary gear SP2 is ~~configured~~ a one-way clutch F1, and the inner race of this one-way clutch F1 is connected to the hub unit 128 which is connected to the ring gear R2 of the first simple planetary gear SP1. Further, on the outer ~~circumference~~ side of this ring gear R2 is ~~configured~~ a brake B2 comprising ~~an oil pressure~~ servo 15 and friction plate 75. The ~~inner circumference side of this~~ friction plate 75 is splined to the ring gear R2 and the hub unit 128, and ~~also the outer circumference side of this friction plate 75 is~~ splined to the inner ~~circumference~~ side of the case 3. ~~that is to say, this~~ ring gear R2 ~~is~~ can be ~~made capable of retaining~~ held against rotation by the brake B2.

Further, the carrier CR3 ~~which has~~ a pinion P3 ~~supported by the side plate~~ is meshed with the inner

surface
~~circumference side~~ of the ~~above-mentioned~~ ring gear R3 ~~via this pinion P3, and this carrier CR3 is meshed~~ and with the ~~above-mentioned~~ sun gear S3, ~~via this pinion P3, and~~ The carrier CR3 is also ~~has~~ linked to the ring gear R2. ~~Further,~~ The carrier CR2 ~~which has~~ supports a pinion P2 ~~supported by the side plate~~ which is meshed with the inner ~~circumference side~~ surface of the ~~above-mentioned~~ ring gear R2 ~~via this pinion P2, and this carrier CR2 meshes with the above-mentioned~~ and with sun gear S2, ~~via this pinion P2~~. Also, this carrier CR2 is linked to the counter gear 5 via ~~this~~ side plate 127.

~~As described above,~~ The second unit planetary gear PR and the clutch C3 are ~~configured~~ located on one side ~~in the axial direction~~ of the first planetary gear unit PU, ~~and also the clutch C2 is configured on one side in the~~ axial direction, and the clutch C1 ~~is configured on the other side in the axial direction, and~~ the counter gear 5 ~~is configured in~~ are located on the axially opposite ~~direction~~ side (right side of the diagram) of the first planetary gear unit PU ~~of the planetary gear PR~~. Further, the clutch C2 is disposed ~~on the inner circumferential side~~ radially inward of the clutch C3, and ~~particularly~~ radially inward of the transmitting member 130, ~~that transmits the output thereof~~. Further, the brake B1 is ~~configured on the outer circumference side of~~ disposed radially outward of the second unit planetary gear PR, and the brake B2 is ~~configured on the outer circumference side~~ disposed radially outward of the first planetary gear unit PU.

~~Continuing, based on the above-mentioned construction,~~

of this fifteenth embodiment

The operations of the automatic transmission device 1-15 will now be described with reference to Fig. 21, Fig. 22, and Fig. 23 below. Now, the vertical axes of the speed line diagram illustrated in Fig. 23 indicate the speeds of each rotary component, and the horizontal axis indicates the corresponding gear ratio of the rotary components. In the first planetary gear unit PU section of this speed line diagram, the vertical axis to the farthest horizontal edge (the right side of Fig. 23) corresponds to ring gear R3, and moving to the left within the diagram, the vertical axes corresponds to the ring gear R2 and the carrier CR3, the carrier CR2, and the sun gear S2 and the sun gear S3. In the second planetary gear unit PR section of this speed line diagram, the vertical axis to the farthest horizontal edge (the right side of Fig. 23) corresponds to sun gear S1, and moving to the left within the diagram, the vertical axes corresponds to the ring gear R1 and the carrier CR1. Further, the widths between these vertical axes are inversely proportional to the number of teeth of each of the sun gears S1, S2, S3, and to the number of teeth of each of the ring gears R1, R3. The dotted line horizontal in the diagram illustrates the speed of rotation is transmitted by the transmitting member 130.

As illustrated in Fig. 21, the rotation of input shaft 2 is input to the ~~above-mentioned~~ sun gear S2 and ~~sun gear~~ S3, by engaging the clutch C1. The rotation of input shaft 2 is also input to the ~~above-mentioned~~ carrier CR3 and ring gear R2, by engaging the clutch C2. ~~and this~~ The carrier CR3 and ring gear R2 can be fixed against rotation by ~~the retaining~~ engagement of the brake B2, and, further, the rotation can be limited to one direction ~~is regulated~~ by the one-way clutch F1.

~~On the other hand,~~ When the rotation of the input shaft 2 is input to the ~~above-mentioned~~ sun gear S1, and the ~~rotation of the above-mentioned~~ carrier CR1 is fixed ~~is~~ to the case 3, ~~and~~ the ~~above-mentioned~~ ring gear R1 rotates ~~with~~ at a reduced speed ~~rotations based on the rotation of the input shaft 2 which is input to this sun gear S1 via this carrier CR1~~. The reduced speed rotation of the ring gear R1 is input to the ~~above-mentioned~~ ring gear R3 via the transmitting member 130, by engaging ~~ing~~ ment of the clutch C3. Further, the ~~rotation of the this~~ ring gear R3 may be fixed against rotation by ~~retaining with~~ engagement of the brake B1.

~~Also,~~ The rotation of the ~~above-mentioned~~ carrier CR2 is output to the ~~above-mentioned~~ counter gear 5, and ~~is output~~ to the drive wheel 5 via this counter gear 5, a counter shaft ~~unit~~ (not illustrated), and a differential unit.

~~At~~ In first speed forward within the D (drive) range, as illustrated in Fig. 22, the clutch C1 and the one-way clutch F1 are engaged. Then, as illustrated in Fig. 23, the

rotation of input shaft 2 is input to the sun gear S2 and ~~the sun gear~~ S3 via the clutch C1, and the rotation of the carrier CR3 and the ring gear R2 is ~~regulated in~~ limited to one direction (the forward rotation direction), ~~in other words, the ring gear R2 is prevent from rotating in the opposite direction and is fixed.~~ ~~Further,~~ With the rotation of the input shaft 2 ~~that is~~ input to the sun gear S2 and the reduced speed rotation ~~is~~ output to the carrier CR2 via the fixed ring gear R2, ~~and~~ the forward rotation for first speed forward is output from the counter gear 5.

~~Now,~~ At this time, within the second planetary gear PR unit, the reduced speed rotation is output to the ring gear R3 via the sun gear S1 ~~wherein~~ (which receives the rotation of the input shaft 2) ~~is input,~~ and the fixed carrier CR1; however, the transmitting member 130 ~~in particular~~ does not transmit torque because the clutch C3 is released. Further, when downshifting (when coasting), the brake B2 is ~~retained~~ engaged and the ring gear R2 is fixed ~~and the above-mentioned state of~~ to maintain first speed forward ~~is maintained~~ while preventing ~~the~~ forward rotation of ~~this~~ ring gear R2.

Further, in ~~this~~ first speed forward, the one-way clutch F1 prevents the ring gear R2 from rotating ~~tion~~ in ~~the opposite direction and~~ reverse while allowing forward rotation, and therefore, switching from a non-driving range to a driving range and achieving ~~the~~ first speed forward can be

accomplished more smoothly by the automatic engaging of the one-way clutch.

In ~~At~~ second speed forward within ~~the~~ D (drive) range, as illustrated in Fig. 22, the clutch C1 and brake B1 are engaged. ~~Then,~~ As illustrated in Fig. 23, the rotation of input shaft 2 is input to the sun gear S2 and ~~the sun gear~~ S3 via the clutch C1, and the ~~rotations of the~~ ring gear R3 ~~are~~ is fixed against rotation. Also, reduced speed rotation is output to the carrier CR3 and the ring gear R2 via the rotation of the input shaft 2 that is input to the sun gear S3 and the fixed ring gear R3. ~~A reduced~~ rotation at a speed reduced from ~~greater than~~ that of the above-mentioned first speed forward is input to the carrier CR2, via the rotation of the input shaft 2 input to the sun gear S2 and the reduced speed rotation input to ~~the~~ ring gear R2, and the forward rotation for second speed forward is output from the counter gear 5.

~~Now,~~ At this time, within the second planetary gear unit PR, the reduced speed rotation is output to the ring gear R3 via the sun gear S1, ~~wherein~~ which receives the rotation of the input shaft 2 ~~is input~~, and the fixed carrier CR1; however, the transmitting member 130 ~~in particular~~ does not transmit torque because the clutch C3 is released.

In ~~At~~ third speed forward within the D (drive) range, as illustrated in Fig. 22, the clutches C1 and ~~the clutch~~ C3 are engaged. ~~Then,~~ As illustrated in Fig. 23, the rotation of

input shaft 2 is input to the sun gear S1 and the ring gear R1 reduces rotation speed from the fixed carrier CR1. Further, the speed reduction speed, rotation of this ring gear R1 is output to the ring gear R3 via the transmitting member 130, from the clutch C3 engaging. On the other hand, the rotation of the input shaft 2 is input to the sun gear S2, and a slightly greater reduced rotation is output to the carrier CR3 and the ring gear R2 from the rotation of the input shaft 2 input to this sun gear S3 and the reduced rotation of the ring gear R3. A reduced rotation greater than that of the above-mentioned second speed forward is output to the carrier CR2 from the rotation of the input shaft 2 input to the sun gear S2 and the slightly greater reduced rotation input to this ring gear R2, and the forward rotation for third speed forward is output from the counter gear 5. In this case, because the ring gear R1 and the ring gear R3 are at a reduced rotation, the above-mentioned transmitting member 130 performs a relatively large torque transmission.

At fourth speed forward within D (drive) range, as illustrated in Fig. 22, the clutch C1 and the clutch C2 are engaged. Then, as illustrated in Fig. 23, the rotation of input shaft 2 is input to the sun gear S2 and the sun gear S3 via the clutch C1, and to the carrier CR3 and the ring gear R2 via the clutch C2. Therefore, by the rotation of

~~the input shaft 2 input to the sun gear S2 and the rotation of input shaft 2 input to the ring gear R2, in other words, in the state of~~ directly coupled ~~rotation,~~ the rotation of the input shaft 2 is output as is into the carrier CR2, and the forward rotation for fourth speed forward is output from the counter gear 5. ~~Now,~~ At this time, within the planetary gear PR, the reduced rotation is output to the ring gear R3 via the sun gear S1 ~~wherein~~ the rotation of the input shaft 2 ~~is input,~~ and the fixed carrier CR1, however, the transmitting member 130 ~~in particular~~ does not transmit torque because the clutch C3 is released.

~~At the~~ In fifth speed forward within the D (drive) range, as illustrated in Fig. 22, the clutch C1 and ~~the clutch~~ C3 are engaged. Then, as illustrated in Fig. 23, the rotation of input shaft 2 is input to the sun gear S1, and the ring gear R1 reduces ~~rotation~~ speed ~~from~~ the fixed carrier CR1. Further, the ~~speed~~ reduction speed rotation of this ring gear R1 is output to the ring gear R3 via the transmitting member 130, ~~from~~ the clutch C3 engaging. ~~On the other hand,~~ The rotation of the input shaft 2 is input to the carrier CR3 and the ring gear R2, and ~~the~~ overdrive rotation is output to the sun gear S2 and ~~the sun gear~~ S3. ~~from the rotation of the input shaft 2 input to this carrier CR3 and the reduced rotations of the ring gear R3. Also, an~~ Overdrive rotation is output to the carrier CR2 from the

rotation of the input shaft 2 input to the ring gear R2 and ~~the overdrive rotation input~~ to ~~this~~ sun gear S2, and the forward rotation for fifth speed forward is output from the counter gear 5. In this case, because the ring gear R1 and the ring gear R3 are rotating at a reduced speed ~~rotation~~, the ~~above-mentioned~~ transmitting member 130 transmits ~~performs~~ a relatively large torque ~~transmission.~~

~~At~~ In sixth speed forward within the D (drive) range, as illustrated in Fig. 22, the clutch C2 ~~is engaged~~ and the brake B1 are engaged ~~is retained~~. Then, as illustrated in Fig. 23, the rotation of the input shaft 2 is input to the carrier CR3 and to the ring gear R2 via the clutch C2, and ~~also~~ the ring gear R3 is fixed by engagement of ~~retaining~~ the brake B1. This produces ~~causes an~~ overdrive rotation (even greater than that of the above-mentioned fifth speed forward), ~~from the rotation of the input shaft 2 input to the carrier CR3 and the fixed ring gear R3, and~~ which is output to the sun gears S3 and ~~the sun gear~~ S2. From the rotation of the input shaft 2 input to the ring gear R2 and the increased rotation speed input to ~~this~~ sun gear S2, a ~~greater~~ raised speed rotation higher than that of the above-mentioned fifth speed forward, is output ~~and the forward rotation for~~ as sixth speed forward ~~is output~~ from the counter gear 5. ~~Now~~ At this time, within the second planetary gear unit PR, the reduced speed rotation is output to the ring gear R3 via the sun gear S1 (which receives ~~wherein~~ the rotation of the input shaft

2 ~~is input~~ and the fixed carrier CR1; however, the transmitting member 130 ~~in particular~~ does not transmit torque, because the clutch C3 is released.

~~At~~ In first speed reverse ~~within an R (reverse) range~~, as illustrated in Fig. 22, the clutch C3 ~~is engaged~~ and the brake B2 ~~is retained~~ are engaged. ~~Then~~ In this manner, as illustrated in Fig. 23, the rotation of the input shaft 2 is input to the sun gear S1, and the ring gear R1 rotates at reduced speed rotations ~~from~~ via the fixed carrier CR1. Further, because the clutch C3 is engaged, the reduced speed rotations of ~~this~~ ring gear R1 is input to the ring gear R2 via the ~~above-mentioned~~ transmitting member 130. ~~On the other hand~~ Further, because the brake B2 is ~~retained~~ engaged, the ~~rotation of the~~ carrier CR3 and the ring gear R2 ~~is~~ are fixed against rotation, and a reverse rotation is output to the sun gear S3 and the sun gear S3 because of the fixed carrier CR3 and the reduced speed rotation of the ring gear R3. ~~Then, a~~ Reverse rotation is output to the carrier CR2, ~~from the fixed~~ with fixed ring gear R2 and the reverse rotation input to ~~this~~ sun gear S2, and the ~~forward~~ rotation for first speed reverse is output from the counter gear 5. ~~Now,~~ In ~~this case~~ reverse, similar ~~to that of the above-mentioned~~ third speed forward ~~or~~ and fifth speed forward, the ring gear R1 and ~~the ring gear~~ R3 are rotating ~~with~~ at a reduced speed ~~rotations~~, and, accordingly, the ~~above-mentioned~~ transmitting member 130 ~~performs~~ transmits a relatively large torque ~~transmission~~.

~~At the~~ In the P (parking) range and ~~the~~ N (neutral) range, the clutch C1, ~~clutch~~ C2, and ~~clutch~~ C3 are released ~~in particular~~, the ~~transmission movement between~~ the input shaft 2 ~~and~~ the counter gear 5 is disconnected from, and the automatic transmission ~~device~~ 1_{15} as a whole is in an idle state (neutral state).

~~As described above, according to~~ In the automatic transmission ~~device~~ 1_{15} ~~relating to the present invention,~~ of this fifteenth embodiment ~~due to~~ because the second planetary gear unit PR and the clutch C2 ~~being configured~~ are located on one side ~~in the axial direction~~ of the first planetary gear unit PU, and the clutch C1 ~~being configured~~ is located on the ~~on the other~~ axially opposite side ~~in the axial direction~~ of the first planetary gear units PR and ~~the planetary gear unit~~ PU can be ~~configured~~ located more closely together, compared to ~~the~~ a transmission ~~case~~ wherein, for example, two clutches C1 and C2 are ~~configured in~~ located between the planetary gear units PR and ~~planetary gear unit~~ PU, and the transmitting member 130 ~~for transmitting reduced rotation~~ can be made relatively shorter. By doing so, the automatic transmission can be made more compact and more lightweight. Further, because the inertia (force ~~of~~ inertia) can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced. Further, compared to the case wherein three clutches C1, C2, C3 are ~~configured~~ located on one side of the planetary gear unit PU, the

oil lines (for example, 2a, 2b, 91, 93, 94) that supply the ~~oil pressure~~ hydraulic servos 11, 12, and 13 of these clutches C1, C2, C3 can be constructed easily, ~~and~~ the manufacturing process can be simplified and the costs ~~brought down~~ can be reduced.

~~Further, since~~ Because the ~~oil pressure~~ hydraulic servos 11 and 12 are ~~provided~~ mounted on the input shaft 2, one set of seal rings 81 and 82 ~~seal~~ form a connection to the case 3 ~~and~~ for supply of oil to the oil lines 2a and 2b ~~provided~~ within input shaft 2, and therefore oil can be supplied to the oil chambers of ~~oil pressure~~ hydraulic servos 11 and 12 without providing seal rings between, for example, the input shaft 2 and the ~~oil pressure~~ hydraulic servos 11 and 12. Further, ~~oil pressure~~ hydraulic servo 13 can receive supply of oil directly from the boss ~~unit~~ 3b ~~provided from the case 3,~~ i.e. without passing through ~~for example~~ other units. ~~in other words, can supply oil by providing one set of seal rings 84.~~ Therefore, oil can be supplied simply by providing one set of seal rings 81 and 82, 84 each of for the ~~oil pressure~~ hydraulic servos 11, 12, and 13, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, because the clutch C2 is ~~configured on the inner circumference side~~ located radially inward of the clutch C3, the clutch C3, which must transmit a relatively large torque ~~in order to transmit~~ at the reduced ~~rotation,~~ speed and its ~~can be configured on the outer circumference side, and this clutch C3 and the oil~~

~~pressure~~ hydraulic servo 13 ~~thereof~~ can have an increased diameter. In particular, the pressure receiving area of the oil chamber of the ~~oil pressure~~ hydraulic servo 13 can be enlarged, and the ~~capacity capable of~~ torque transmission capacity of this clutch C3 can be increased. ~~By configuring~~ Further, the clutch C2 ~~on the inner circumference side, which can~~ can be designed to have a smaller capacity ~~for~~ torque transmission ~~compared to~~ than the clutch C3, and therefore the automatic transmission can be made more compact.

Further, the clutch C1 ~~is a clutch which~~ engages at the relatively slow to medium speeds ~~levels~~ of first speed forward, second speed forward, third speed forward, and fourth speed forward, and therefore when this clutch C1 is released at the relatively high speeds ~~levels of~~ i.e. fifth speed forward, sixth speed forward, ~~or~~ and first speed reverse, ~~particularly~~ the hub unit 122 that connects this clutch C1 and the sun gear S2 rotates at a relatively high ~~revolution~~ speed or ~~revolves~~ in reverse (see Fig. 3). ~~On the other hand, at~~ Because in ~~the~~ fifth speed forward ~~of~~ and first speed reverse the transmitting member 130 rotates at a reduced ~~rotation~~ speed, and ~~at~~ in a sixth speed forward the transmitting member 130 may be fixed in some cases, ~~and difference in revolutions between~~ the speeds of the hub unit 122 and the transmitting member 130 can ~~occur~~ differ. However, because ~~this~~ clutch C1 is located on the ~~opposite~~ side of the first planetary gear ~~PR via the~~ unit PU axially opposite the second planetary gear unit PR, the hub unit 122 and the transmitting member 130 can be

~~configured~~ spaced apart from one another. ~~In~~ As compared with a transmission ~~case~~ wherein, for example, these members are in contact due to a multi-axial configuration, decreased efficiency of the automatic transmission resulting from friction and so forth from the relative rotation of those units can be ~~prevented~~ avoided.

~~Further,~~ The automatic transmission ~~device~~ 1_{15} ~~according to the present~~ of this fifteenth embodiment is ~~a transmission device that is~~ directly coupled ~~at~~ in fourth speed forward. Therefore, ~~at~~ in fifth speed forward and sixth speed forward, the gear ratio can be ~~specified to~~ a high ratio, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine ~~revolutions~~ speed can be ~~lowered, and this contributes to the quietness of~~ reduced thereby allowing the vehicle ~~while~~ To running more quietly at a high speed.

~~Now, the linking member (in particular the transmitting member) for~~ The linking the planetary gear units PR and ~~the planetary gear unit~~ PU requires rigidity to withstand the reduced speed torque that ~~is input~~ it transmits. ~~For example, in the case of configuring~~ A clutch that engages at a slow to medium speed ~~or~~ and a clutch that engages and disengages a reduced speed rotations on the inner ~~circumference~~ side of the ~~linking~~ transmitting member, ~~the clutches~~ must have a large capacity, and therefore an ~~appropriate~~ diameter ~~to~~ correspond with this capacity becomes necessary. Therefore, ~~in the event that~~ if the ~~linking member is the type that~~ transmitting member passes on the outer circumference, Fig. 2/

side of this type of clutch, ~~even~~ an larger diameter ~~than the necessary diameter measurement of those clutches~~ becomes necessary, ~~and the diameter measurement of~~ the linking member ~~is~~ must be enlarged ~~more than necessary~~, and the automatic transmission as a whole ~~becomes greater in the direction of~~ is increased in diameter. Therefore an object of the present embodiment is to ~~reduce the enlargement~~ allow reduction of the diameter ~~measurement~~, and provide a more compact automatic transmission.

According to the present embodiment, ~~all clutches can be configured without~~ enlarging the diameter ~~measurement~~ of the linking member is avoided, by ~~configuring~~ locating a clutch C2 with a small capacity ~~on the linking member, particularly~~ on the inner ~~circumference~~ side of the transmitting member 130.

Sixteenth Embodiment

~~Below~~, The sixteenth embodiment, which is a partial modification of the fifteenth embodiment will now be described with reference to Figs. 24 through ~~Fig.~~ 26. ~~Fig. 24 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the sixteenth embodiment, Fig. 25 is an operational table of an automatic transmission relating to the sixteenth embodiment, and Fig. 26 is a speed line diagram of an automatic transmission relating to the sixteenth embodiment.~~

~~Now,~~ Components of the sixteenth embodiment which are the same as those of the fifteenth embodiment ~~will be~~ are denoted

~~with~~ by the same reference numerals, and description thereof ~~omitted~~ will not be repeated, except for ~~partial~~ modifications.

As illustrated in Fig. 24, ~~an~~ the automatic transmission ~~device~~ 1_{16} of ~~an automatic transmission relating to~~ the sixteenth embodiment ~~is a modification of~~ differs with regard to the configuration of the second planetary gear unit PR and the clutch C3, as compared to ~~that of an~~ the automatic transmission ~~device~~ 1_{15} of ~~an automatic transmission relating to~~ the fifteenth embodiment (see Fig. 21). In this sixteenth embodiment

The clutch C3 is ~~configured~~ located on the planetary gear unit PU side (left side of diagram) of the second planetary gear unit PR. ~~within this automatic transmission device 1_{16}.~~ The inner ~~circumference side~~ surface of ~~the~~ a front ~~edge~~ portion of the ~~drum-shaped member~~ 125 of this clutch C3 is splined to the friction plates 73, ~~and the inner circumference side of this~~ which are intermeshed with friction plates ~~74~~ splined to the hub unit 126. The ~~drum-shaped member~~ 125 is connected to the input shaft 2, and the hub unit 126 is connected to the sun gear S1. ~~Further,~~ The clutch C2 ~~comprising~~ includes a ~~oil pressure~~ hydraulic servo 12, a friction plates 72, a ~~drum-shaped member~~ 123, and a hub unit 124 and is ~~configured on the inner circumference side~~ located radially inward of the ~~above-mentioned~~ clutch C3, ~~that is to say,~~ Thus, clutch C2 is enclosed within the hub unit 126.

~~On the other hand,~~ On the outer ~~circumference~~ radially side of the planetary gear PR is ~~configured~~ a multi-disc brake B1

that comprises ~~an oil pressure~~ a hydraulic servo 14 and ~~a~~ friction plates 74. The side plate of the carrier CR1 of this planetary gear unit PR is fixed to and supported by the case 3. Further, the ring gear R1 is connected to the transmitting member 130, and the friction plates 74 of the brake B1 ~~is~~ are splined ~~with~~ to the outer circumferential surface ~~side~~ of ~~this~~ transmitting member 130 which ~~and this transmitting member 130~~ is connected to the ring gear R3.

~~Continuing, based on the above-mentioned construction,~~

The operations of ~~an~~ the automatic transmission ~~device~~ 1_{16} will now be described with reference to Fig. 24, Fig. 25, and Fig. 26 ~~below~~. ~~Now~~, As with the above-mentioned first embodiment, the vertical axis of the speed line diagram illustrated in Fig. 26 indicates the ~~revolutions~~ speeds of each ~~rotation~~ rotary component, and the horizontal axis indicates the corresponding gear ratio of these rotary components. Further, regarding the planetary gear unit PU section of this speed line diagram, the vertical axis to the farthest horizontal edge (the right side of Fig. 26) corresponds to ring gear R3, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the vertical axis corresponds to the ring gear R2 and the carrier CR3, the carrier CR2, and the sun gear S2 and the sun gear S3. Further, regarding the second planetary gear unit PR section of this speed line diagram, the vertical axis to the farthest horizontal edge (the right side of Fig. 26)

corresponds to sun gear S1, and hereafter moving to the left direction within the diagram, the vertical axis corresponds to the ring gear R1 and the carrier CR1. Further, the widths between these vertical axes are proportional to the inverse of the number of teeth of each of the sun gears S1, S2, S3, and to the inverse of the number of teeth of each of the ring gears R1, R3. Also, the dotted line in the horizontal direction in the diagram illustrate that the rotation is transmitted from the transmitting member 130.

As illustrated in Fig. 24, by engaging the clutch C3, the rotation of the input shaft 2 is input to the sun gear S1. Further, the rotation of the above-mentioned carrier CR1 is fixed as to the case 3, and the above-mentioned ring gear R1 rotates at reduced rotations based on the rotation of the input shaft 2 input to sun gear S1. In other words, by engaging the clutch C3, the reduced rotation of the ring gear R1 is input to the ring gear R3 via the transmitting member 130.

When As illustrated in Fig. 25 and Fig. 26, within the planetary gear PR, at third speed forward, fifth speed forward, and first speed reverse, the rotation of the input shaft 2 is input to the sun gear S1 by engaging the clutch C3, the reduced rotation is output to the ring gear R3 from the fixed carrier CR1, and the reduced rotation is input to the ring gear R3 via the transmitting member 130. At this

time, the ring gear R1 and the ring gear R3 are rotating at a reduced speed, and therefore the ~~above-mentioned~~ transmitting member 130 ~~performs~~ transmits a relatively large torque. ~~transmission.~~ On the other hand, ~~at~~ in first speed forward, second speed forward, fourth speed forward, and sixth speed forward, the rotation of the ring gear R3 is input to the ring gear R1 via the transmitting member 130, and further, because clutch C3 is released, as illustrated in Fig. 7, the sun gear S1 rotates ~~based on each different~~ in accordance with the speed ~~level~~ of ring gear R1, ~~and the fixed carrier GR1.~~ units

~~Now,~~ The ~~actions~~ operations of the second planetary gear unit PR are similar to those of the above-~~mentioned~~ described fifteenth embodiment (see Fig. 22 and Fig. 23), and accordingly description thereof will be omitted.

~~As described above, according to~~ In the automatic transmission ~~device~~ 1_{16} ~~relating to the present invention,~~ of this sixteenth embodiment, ~~due to~~ because the second planetary gear unit PR and the clutch C2 ~~being configured~~ are located on one side ~~in the axial direction~~ of the first planetary gear unit PU, and the clutch C1 ~~being configured~~ is located on the ~~other side in the~~ opposite side axial ~~direction~~ of the first planetary gear units PU, the planetary gear PR and ~~the planetary gear unit~~ PU can be ~~configured~~ located more closely together, compared to ~~the case~~ a transmission wherein, for example, two clutches C1 and C2 are ~~configured in~~ located between the planetary gear units PR and ~~planetary gear unit~~ PU, and the transmitting member 130 ~~for~~

~~transmitting reduced rotation~~ can be relatively shortened. ~~By doing so~~, the automatic transmission can be made more compact and more lightweight. Further, because the inertia force ~~of~~ inertia can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced. Further, compared to ~~the case~~ wherein three clutches C1, C2, C3 are ~~configured~~ on one side of the planetary gear unit PU, the oil lines (for example, 2a, 2b, 91, 93, 94) that supply the ~~oil pressure~~ servos 11, 12, and 13 of these clutches C1, C2, C3 can be constructed easily, ~~and~~ the manufacturing process can be simplified and the costs ~~brought down~~.

Further, since the ~~oil pressure~~ servos 11 and 12 are ~~provided~~ on the input shaft 2, one set of seal rings 81 and 82 seal the case 3 ~~and~~ supply oil to the oil lines 2a and 2b ~~provided within input shaft 2~~, and therefore oil can be supplied to the oil chamber of ~~oil pressure~~ servos 11 and 12 without providing ~~the~~ seal rings between, for example, the input shaft 2 and the ~~oil pressure~~ servos 11 and 12. Further, the ~~oil pressure~~ servo 13 can supply oil from the boss ~~unit~~ 3a extended from the case 3, without passing through other ~~parts for example, and therefore can supply oil by providing one set of seal rings 84.~~ Therefore, oil can be supplied simply by providing one set of seal rings 81 and 82, 84 each for the ~~oil pressure~~ servos 11, 12, and 13,

~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, the clutch C1 ~~is a clutch which~~ engages at the relatively slow to medium speed ~~levels~~ of first speed forward, second speed forward, third speed forward, and fourth speed forward, and therefore when this clutch C1 is released at the relatively high speed ~~levels~~ of fifth speed forward, sixth speed forward, ~~or~~ and first speed reverse, ~~particularly~~ the hub unit 122 that connects ~~this~~ clutch C1 and the sun gear S2 rotates at a relatively high ~~revolution~~ speed or ~~revolves~~ in reverse (see Fig. 3). On the other hand, ~~at~~ in the fifth speed forward ~~or~~ and first speed reverse the transmitting member 130 rotates at a reduced ~~rotation~~ speed, and ~~at a~~ in sixth speed forward the transmitting member 130 may be fixed in some cases, ~~and difference in revolutions between~~ whereby the speeds of the hub unit 122 and the transmitting member 130 ~~can occur~~ may differ. However, because ~~this~~ clutch C1 is located on the ~~opposite~~ side of the first planetary gear unit PU opposite the second planetary gear unit PR ~~via~~, the hub unit 122 and the transmitting member 130 can be ~~configured~~ spaced apart from one another. ~~In~~ As compared with ~~the~~ a transmission ~~case~~ wherein, for example, these members are in contact due to a multi-axial configuration, decreased efficiency of the automatic transmission resulting from friction and so forth from the relative rotation of those units can be ~~prevented~~ avoided.

Further, ~~in the event that~~ if the clutch C3 is placed between the ring gear R1 and the sun gear S3, for example, the reduced speed rotation must be engaged and disengaged, and ~~the~~ clutch C3 ~~becomes~~ must be relatively large, but by placing clutch C3 between the input shaft 2 and the sun gear S1, the engaging and disengaging of ~~the rotation of the input shaft 2 from this~~ clutch C3 ~~causes~~ indirectly controls transmission of the reduced speed rotation ~~output~~ from the ring gear R1 of the second planetary gear unit PR ~~to be engaged and disengaged~~, ~~and~~ the clutch C3 can be made more compact, and therefore the automatic transmission can be made more compact.

Further, the automatic transmission ~~device~~ 1_{16} ~~according to the present~~ of this sixteenth embodiment is ~~a transmission device that is~~ directly coupled ~~at~~ in fourth speed forward. Therefore, ~~at~~ in fifth speed forward and sixth speed forward, the gear ratio can be ~~specified to~~ a high ratio, and ~~particularly~~ when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine ~~revolutions~~ speed can be ~~lowered~~ reduced, and ~~this contributes to the quietness of the~~ the vehicle ~~while~~ can run more quietly at a high speed.

~~Now, in the event that~~ If a clutch is ~~configured in~~ located between the planetary gear units PR and ~~the planetary gear unit~~ PU ~~for example~~, the length of the ~~linking member (particularly the~~ transmitting member units that links the planetary gear units PR and ~~the planetary gear unit~~ PU ~~becomes longer in the~~ must be axially ~~direction~~ elongated, and since this ~~linking member is for~~ transmitting member

transmits speed transmitting

the reduced rotation, the thickness of the member must be increased ~~so as to withstand this,~~ and therefore the weight also increases. Therefore an object of the present invention is to provide an automatic transmission that can shorten the distance between the ~~speed reduction~~ planetary ~~gear and the planetary~~ gear units and thereby reduce ~~the increase in~~ weight.

~~With~~ In the present embodiment, ~~in particular,~~ the clutch C2 is disposed on the ~~opposite~~ side ~~in the axial direction~~ of the first planetary gear unit PU ~~from~~ opposite the second planetary gear unit PR, and therefore ~~providing~~ a clutch between the planetary gear units PR and ~~the planetary gear unit~~ PU is not necessary, and the length of ~~the linking member, particularly~~ the transmitting member 130 can be ~~made that much~~ shorter. Therefore, ~~an~~ the ~~increase in~~ weight of the automatic transmission as a whole can be ~~prevented~~ reduced.

~~Seventeenth Embodiment~~

~~Now, the~~ A seventeenth embodiment, which is a partial modification of the fifteenth embodiment will now be described with reference to Fig. 27 through Fig. 29. ~~Fig. 27 is a schematic cross-sectional diagram illustrating~~ the automatic transmission device of an automatic transmission relating to the seventeenth embodiment, Fig. 28 is an operational table of an automatic transmission relating to the seventeenth ~~embodiment, and Fig.~~ 29 is a speed line diagram of an

~~automatic transmission relating to the seventeenth embodiment. Now,~~ Components of the seventeenth embodiment which are the same as those of the fifteenth embodiment ~~will~~ are ~~be~~ denoted ~~with~~ by the same reference numerals, and description thereof omitted, except for ~~partial~~ the modifications.

As Fig. 27 illustrates, the automatic transmission ~~device~~ 1_{17} of the ~~automatic transmission relating to the~~ seventeenth embodiment ~~is a modification of the~~ differs from the fifteenth embodiment with respect to the configuration of the clutch C2, and ~~further, configures~~ in use of a brake B3 instead of a clutch C3, ~~and enables~~ whereby the carrier CR1 of the second planetary gear unit PR ~~to~~ can be fixed by the brake B3. ~~Compared to that of the automatic transmission device 1_{16} of the automatic transmission of the fifteenth embodiment (see Fig. 21).~~

Within the automatic transmission ~~device~~ 1_{17}, the brake B3 is ~~configured~~ located on the planetary gear PR, on the ~~opposite~~ side (left side on the diagram) ~~from~~ opposite the planetary gear unit PU. This brake B3 comprises ~~an oil pressure~~ a hydraulic servo 16, friction plates 76, and a hub unit 133. Further, the clutch C2, comprising ~~an oil pressure~~ a hydraulic servo 12, friction plates 72, a drum ~~shaped member~~ 123, and a hub unit 124, is ~~configured on the inner circumference side of above mentioned~~ located radially inward of the brake B3, ~~that is to say, is enclosed~~ and within the hub unit 133. The hub unit 133 of ~~this~~ brake B3 is connected to ~~the~~ one side plate ~~of one side~~ of the carrier CR1, and the other side plate of the

~~other side of this~~ carrier CR1 is supported by the input shaft 2 ~~so as to be capable of rotating~~. Further, the sun gear S1 is connected to the input shaft 2 via the drum ~~shaped member~~ 123 of the clutch C2. ~~Also,~~ the friction plate 74 of the brake B1 ~~is~~ splined ~~with~~ the outer circumference ~~side~~ of the ring gear R1, and this ring gear R1 is connected ~~to~~ the transmitting member 130 ~~and is connected~~ to the sun gear S3, ~~via this transmitting member 130.~~

~~Continuing, based on the above-mentioned construction~~, the operations of ~~an~~ automatic transmission ~~device~~ 1_{17} will be described with reference to Fig. 27, Fig. 28, and Fig. 29 below. Now, as with the above-mentioned first embodiment, the vertical axis of the speed line diagram illustrated in Fig. 29 indicates the ~~revolutions~~ of each rotation component, and the horizontal axis indicates the corresponding gear ratio of these rotation components. ~~Further, regarding~~ the planetary gear unit PU section of this speed line diagram, the vertical axis to the farthest horizontal edge (the right side of Fig. 29) corresponds to ring gear R3, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the vertical axis corresponds to the ring gear R2 and the carrier CR3, the carrier CR2, and the sun gear S2 and ~~the sun gear~~ S3. Further, ~~regarding~~ the planetary gear PR section of this speed line diagram, the vertical axis to the

farthest horizontal edge (the right side of Fig. 29) corresponds to sun gear S1, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the vertical axis corresponds to the ring gear R1 and the carrier CR1. Further, the widths between these vertical axes are inversely proportional to the ~~inverse of the~~ number of teeth of each of the sun gears S1, S2, S3, and to the ~~inverse of the~~ number of teeth of each of the ring gears R1, R3. Again, the dotted line ~~in the~~ horizontal ~~direction~~ in the diagram represents ~~illustrate that~~ the rotation is transmitted by ~~from~~ the transmitting member 130.

As Fig. 27 illustrates, by engaging ~~retaining~~ the brake B3, the ~~above-mentioned~~ carrier CR1 is fixed ~~so~~ to the case 3. Further, the rotation of the input shaft 2 is input to the sun gear S1, and the ~~above-mentioned~~ ring gear R1 rotates at reduced speed rotations based on the rotation of input shaft 2 which is input to this sun gear S1, ~~because this~~ with the carrier CR1 is fixed. In other words, by engaging the brake B3, the reduced speed rotation of the ring gear R3 is input to the sun gear S3 via the transmitting member 130.

~~By doing so,~~ As Fig. 28 and Fig. 29 illustrate, ~~regarding~~ with regard to the second planetary gear unit PR, ~~at~~ in third speed forward, fifth speed forward, and first speed reverse, the rotation of the input shaft 2 is input to the sun gear S1 by ~~retaining~~ engagement of the brake B3 to fix the carrier CR1 ~~is fixed~~, and the reduced speed rotation is output to the ring gear R3 by the

rotation of the sun gear S1 ~~wherein the~~ which receives input of rotation of the input shaft 2 ~~is input~~, and the reduced speed rotation is input to the sun gear S3 via the transmitting member 130. In this case, the ring gear R1 and ~~the ring gear~~ R3 are rotating at the reduced speed, and therefore the ~~above-mentioned~~ transmitting member 130 ~~performs~~ transmits a relatively large torque. ~~transmission.~~ On the other hand, at first speed forward, second speed forward, fourth speed forward, and sixth speed forward, the rotation of the ring gear R3 is input to the ring gear R1 via the transmitting member 130, and further, because the brake B3 is released, as Fig. 29 illustrates, the carrier CR1 rotates ~~based on each the rotation~~ within the speed range ~~level~~ of this ring gear R1 and the sun gear S1. ~~of the rotation of the input shaft 2.~~

~~Now,~~ The ~~actions~~ operations of the ~~above-mentioned~~ second planetary gear unit PR are similar to those of the ~~above-described~~ fifteenth embodiment (see Fig. 22 and Fig. 23), and accordingly description thereof will ~~be omitted.~~ not be repeated here

~~As described above, according to~~ In the automatic transmission ~~device~~ 1_{17} ~~relating to the present invention~~ of this seventeenth embodiment, due to the planetary gear PR and the clutch C2 being ~~configured~~ located on one side ~~in the axial direction~~ of the planetary gear unit PU, and the clutch C1 being ~~configured~~ located on the ~~other side in the~~ axial ~~direction~~ opposite side of the planetary gear unit PU, the planetary gear PR and the planetary gear

unit PU can be ~~configured~~ located more closely together, as compared to a transmission ~~the case~~ wherein, for example, two clutches C1 and C2 are ~~configured in~~ disposed between the planetary gear units PR and ~~planetary gear unit~~ PU, and the transmitting member 130 ~~for transmitting reduced rotation~~ can be made relatively shorter. By doing so, the automatic transmission can be made more compact and more lightweight. Further, because the inertia force ~~of~~ inertia can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced.

Further, since the ~~oil pressure~~ hydraulic servos 11 and 12 are ~~provided~~ mounted on the input shaft 2, one set of the seal rings 81 and 82 seal the case 3 ~~and~~ to the input shaft 2 for supply oil to the oil lines 2a and 2b provided within input shaft 2, and therefore oil can be supplied to the oil chambers of ~~oil pressure~~ hydraulic servos 11 and 12 without providing ~~the~~ seal rings between, for example, the input shaft 2 and the ~~oil pressure~~ hydraulic servos 11 and 12. Therefore, oil can be supplied simply by providing one set of the seal rings 81 and 82 of each for the ~~oil pressure~~ hydraulic servos 11 and 12, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, the clutch C1 ~~is a clutch which~~ engages at the relatively slow to medium speeds ~~levels~~ of first speed forward, second speed forward, third speed forward, and

fourth speed forward, and therefore when this clutch C1 is released at the relatively high speed ~~levels~~ of fifth speed forward, sixth speed forward, or first speed reverse, ~~particularly~~ the hub unit 122 that connects this clutch C1 and the sun gear S2 rotates at a relatively high ~~revolution~~ or ~~revolves~~ in reverse (see Fig. 3). On the other hand, ~~at~~ ~~the~~ fifth speed forward ~~or~~ first speed reverse the transmitting member 130 ~~reduced~~ ~~rotation~~ speed, and ~~at~~ a sixth speed forward the transmitting member 130 may be fixed in some cases, and ~~difference in revolutions between~~ the hub unit 122 and the transmitting member 130 can ~~occur~~. However, because ~~this~~ ~~clutch~~ C1 is located on the ~~opposite~~ side of the planetary gear PR ~~via the~~ planetary gear unit PU, the hub unit 122 and the transmitting member 130 can be ~~configured~~ apart from one another. In comparison with ~~the case~~ wherein, for example, these members are in contact due to a multi-axial configuration, decreased efficiency of the automatic transmission resulting from friction and so forth from the relative rotation of those units can be ~~prevented~~.

Further, since the reduced rotation output to the planetary gear unit PU from the planetary gear PR is ~~made to be~~ engaged and disengaged by the brake B3, the number of ~~parts~~ (for example drum ~~shaped members~~ and so forth) can be reduced as compared to ~~the case wherein~~, for example, clutch C3, ~~is provided~~. Further, the brake B3 can ~~configure~~

~~an~~ oil ~~line~~ supply directly from the case 3, and therefore the configuration of the oil line can be simplified as compared to the case wherein, for example, a clutch C3 is provided.

~~Further,~~ The automatic transmission device 1_{17} ~~according to the present~~ of this seventeenth embodiment is ~~a transmission device that is~~ directly coupled ~~at~~ in fourth speed forward. Therefore, ~~at~~ in fifth speed forward and sixth speed forward, the gear ratio can be ~~specified to~~ a high ratio, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine ~~revolutions~~ speed can be ~~lowered~~ reduced, ~~and this contributes to the quietness of~~ whereby the vehicle ~~while~~ will run~~ning~~ more quietly at a high speed.

~~Now, in the event that~~ If a clutch is ~~configured~~ located in between the planetary gear PR and the planetary gear unit PU for example, the length of the linking member (particularly the transmitting member) that links the planetary gear PR and the planetary gear unit PU becomes longer in the axial direction, and since this linking member is for transmitting the reduced rotation, the thickness of the member must be increased so as to withstand this, and therefore the weight also increases. Therefore an object of the present invention is to provide an automatic transmission that can shorten the distance between the speed reduction planetary gear and the planetary gear unit, and ~~reduce the increase in~~ weight.

In this seventeenth embodiment, because ~~With the present embodiment, in particular,~~ the clutch C2 is disposed on the ~~opposite~~ side ~~in the axial direction~~ of the first planetary gear unit PU ~~from~~ the opposite second planetary gear unit PR, ~~and therefore~~, providing sion of a clutch between the second planetary gear unit PR and the first planetary gear unit PU is not necessary, and the length of the ~~linking member, particularly the~~ transmitting member 130 can be ~~made that much~~ shorter. Therefore, an ~~increase in~~ weight of the automatic transmission as a whole can be ~~prevented~~ less.

~~C~~ Eighteenth Embodiment

~~Below, the~~ An eighteenth embodiment, which is a partial modification of the first through the seventeenth embodiments will now be described, with reference to Fig. 30 through Fig. 32. ~~Fig. 30 is a schematic cross-sectional diagram illustrating~~ the automatic transmission device of an automatic transmission relating to the eighteenth embodiment, Fig. 31 is an operational table of an automatic transmission relating to the eighteenth embodiment, and Fig. 32 is a speed line diagram of an ~~automatic transmission relating to the eighteenth embodiment.~~ Now, components of the eighteenth embodiment which are the same as those of the first embodiment ~~will be~~ are denoted ~~with~~ by the same reference numerals, and description ~~thereof~~ will be omitted, except for ~~partial~~ modifications.

As illustrated in Fig. 30, ~~an~~ the automatic transmission

of the eighteenth embodiment

~~device~~ 1_{18} comprises a first planetary gear unit PU and a second planetary PR on the input shaft 2. ~~This~~ The first planetary gear unit PU is a multiple type planetary gear unit, which comprises a sun gear S2, a carrier CR2, a ring gear R2, and a sun gear S3, ~~as the~~ a total of four ~~rotation~~ rotary components, ~~wherein~~ the carrier CR2 ~~has~~ supports a long pinion PL, that meshes with ~~a~~ the sun gear S3 and ~~a~~ the ring gear R2, ~~supported by a side plate,~~ and a short pinion PS that meshes with ~~a~~ the sun gear S3, ~~which are~~ with pinions PL and PS meshed one to another.

Further, the ~~above-mentioned~~ second planetary gear unit PR is a double pinion planetary gear unit that has a carrier CR1, ~~wherein a~~ supporting a pinion Pb, which is meshed with a ring gear R1, and a pinion Pa, which is meshed with a sun gear S2, ~~which are~~ with the pinions Pa and Pb meshed one to another.

On the ~~above-mentioned~~ input shaft 2 is ~~configured~~ a multi-disc clutch (second clutch) C2 on the inner circumference side, which comprises ~~an oil pressure~~ a hydraulic servo 12, ~~a~~ friction plates 72, a clutch drum ~~shaped member~~ 223 ~~that forms a clutch drum~~, and a hub unit 224 linked to ~~a~~ the sun gear S2, ~~and~~ a multi-disc brake B2, located on the outer circumference side, ~~which~~ comprises ~~an oil pressure~~ a hydraulic servo 15, and ~~a~~ friction plates 75 that are intermeshed with friction plates ~~that is~~ splined to the ~~with the above-mentioned~~ hub unit 224.

The oil chamber of this ~~oil pressure~~ hydraulic servo 12 is extended from one ~~edge~~ end of the case 3, and is connected to an oil line 91 of the boss ~~unit~~ 3a which is formed as a sleeve ~~provided~~ on the ~~above-mentioned~~ input shaft 2, ~~in a sleeve form.~~ Also, this oil line 91 ~~is linked~~ connects to an oil pressure control unit not

illustrated. ~~In other words,~~ Because the ~~above mentioned~~ ~~oil pressure~~ hydraulic servo 12 is ~~configured~~ mounted on the boss ~~unit~~ 3a, an oil line from the oil pressure control unit, not illustrated, is connected to the oil chamber of the ~~oil pressure~~ hydraulic servo 12 ~~is~~ which provide a ~~constructed~~ by one set of seal rings 81 ~~to~~ seal between ~~this~~ boss unit 3a and the clutch ~~drum-shaped member~~ 223.

Further, the above-mentioned input shaft 2 is connected to the ~~above-mentioned~~ clutch drum-shaped ~~member~~ 223, and ~~on~~ the inner ~~circumference side~~ surface of ~~the~~ a front ~~edge~~ portion of this ~~drum-shaped member~~ 223 is ~~configured the~~ splined to friction plate 72 of the clutch C2 which is ~~capable of engaging~~ operated by the ~~oil pressure~~ servo 12 ~~for the clutch C2, splined.~~ Further, ~~this~~ hub unit 224 is connected to the ~~above-mentioned~~ sun gear S2. Further, the brake B2 has friction plates 75 intermeshed with friction plates splined to ~~is disposed by splining on~~ the outer circumference ~~side~~ surface of the ~~above-mentioned~~ drum-shaped ~~member~~ 224, ~~capable of~~ ed engaging by ~~an~~ operation of hydraulic ~~oil pressure~~ servo 15.

~~On the other hand,~~ At the other ~~side~~ end (the left of the diagram) of the input shaft 2 is ~~configured~~ a multi-disc clutch (first clutch) C3 which comprises ~~an oil pressure~~ a hydraulic servo 13, friction plate 73, a clutch ~~drum-shaped member~~ 225 ~~that forms a clutch drum~~, and a hub unit 226. ~~The~~ friction plate 73 ~~is~~ are splined ~~with~~ to the inner ~~circumference side~~ surface of ~~the~~ a front ~~edge~~ portion of the clutch ~~drum-shaped member~~ 225 ~~of this clutch~~ C3, and ~~this~~ with friction plate ~~73, is~~ 5 are intermeshed splined ~~with~~ to the outer ~~circumference side~~ surface of ~~the~~ a front ~~edge~~ portion of the hub unit 226.

~~and this hub unit 226~~ which is connected to the carrier CR2.

The oil chamber of this ~~oil pressure~~ hydraulic servo 13 is connected ~~to~~ through an oil line 2b which is formed on the ~~above-mentioned~~ input shaft 2 ~~and this oil line 2b is provided along the edge of the case 3 that is the opposite side of that of the above-mentioned boss unit 3a, and is connected to the~~ to oil line 93 of the boss ~~unit~~ 3b which, ~~is provided on the input shaft 2 in a sleeve form, and this oil line 93 is linked~~ in turn, is connected to ~~an~~ the oil pressure control unit ~~not illustrated.~~ Therefore, ~~regarding the above-mentioned oil pressure servo 13,~~ by providing one set of seal rings 81 to seal between the boss ~~unit~~ 3b ~~of the case 3~~ and the drum-~~shaped~~ member 225, ~~configures~~ an oil line from the oil pressure control device, ~~not illustrated,~~ is connected to the oil chamber of the oil pressure servo 13.

~~Further,~~ Mounted on the boss ~~unit~~ 3b is ~~configured~~ a multi-disc clutch (third clutch) C1, comprising ~~an oil pressure~~ a hydraulic servo 11, a friction plate 71, and a drum-~~shaped~~ member 221. The oil chamber of the ~~above-mentioned oil pressure~~ hydraulic servo 11 is ~~linked~~ connected to the oil line 94 of the ~~above-mentioned~~ boss ~~unit~~ 3b, and ~~this~~ through oil line 94 ~~is linked~~ to ~~an~~ the oil pressure control unit, ~~not illustrated.~~ ~~Therefore, regarding the above-mentioned oil pressure servo 11, an oil line from the oil pressure control unit, not illustrated, to the oil chamber of the oil pressure servo 11, is constructed by one~~

18th Embod Fig. 30

~~set of seal rings 84 that seal between the boss unit 3b of~~ the case 3 and ~~the drum-shaped member 221~~.

~~Further, on the above-mentioned~~ The boss unit 3b ~~in the left of the diagram,~~ rotatably supports the drum ~~shaped member~~ 221 ~~as supported so as to be capable of rotating~~, and ~~on the~~ a front ~~edge~~ portion of the inner ~~circumference side~~ surface of ~~the~~ drum ~~shaped member~~ 221 is splined to the friction plate 71 of the clutch C1 ~~is splined, which can be~~ engaged by the ~~oil pressure~~ hydraulic servo 11. ~~for the clutch C1.~~ ~~On~~ Around the outer circumference ~~side~~ of this clutch C1 is ~~configured~~ a hub unit 222 on which is formed the ~~above-mentioned~~ ring gear R1, ~~by splining, and~~ this hub unit 222 is rotatably supported by the input shaft 2. ~~so as to be capable of rotation. Further, the~~ Carrier CR1 ~~comprises~~ supports a ~~pinion Pa and a pinion Pb, and this~~ pinion Pb ~~is~~ meshed with the ~~above-mentioned~~ ring gear R1, and ~~this~~ a pinion Pa meshed with the sun gear S1 which is connected to the input shaft 2. This carrier CR1 is fixed to the boss ~~unit~~ 3b of the case 3, via a side plate.

Also, the drum ~~shaped member~~ 221, to which the above-mentioned clutch C1 is splined, is rotatably supported by the ~~above-mentioned~~ boss ~~unit~~ 3b ~~so as to rotate~~, and is connected to a transmitting member 230 ~~is connected~~ for transmitting the rotation of the ring gear R1, when the clutch C1 is engaged, ~~and further, on the other side of this transmitting member 230 is connected~~ to the sun gear S3 of the ~~above-mentioned~~ first planetary gear unit

PU.

~~On the other hand, on~~ Around the outer circumference ~~side~~ of the first planetary gear unit PU is ~~configured~~ a multi-disc brake B1 that comprises ~~an oil pressure~~ a hydraulic servo 14, friction plates 74, and a hub unit 228. ~~To the~~ A side plate of the carrier CR2 of the ~~above-mentioned~~ first planetary gear unit PU is connected to a hub unit 228 ~~that is splined the~~ To which are splined friction plates of the above-mentioned brake B1, ~~and~~ further, this hub unit 228 is connected to the inner race of a one-way clutch F1. The short pinion PS of this carrier CR2 meshes with the sun gear S3. Further, the ~~above-mentioned~~ sun gear S2 and ring gear R2 ~~are~~ mesh with the long pinion PL, ~~of this carrier CR2~~, ~~a linking~~ transmitting member 227 ~~is~~ connected ~~to~~ one edge of ~~this~~ ring gear R2, ~~and this ring gear R3 is linked~~ to the counter gear 5 ~~via this linking member 227~~.

As described above, the second planetary gear unit PR and the clutch C3 are ~~configured~~ located on one side ~~in the axial direction~~ of the first planetary gear unit PU, ~~and also the clutch C1 is configured on one side in the axial direction~~, and the clutch C2 ~~is configured on the other side in the axial direction,~~ and the counter gear 5 ~~is configured in the~~ are located on the axially opposite ~~direction~~ side (right side of the diagram) of the first planetary gear unit PU ~~of the planetary gear PR~~. Further, the clutch C3 is ~~disposed on the inner circumferential side~~ arranged radially inward of the clutch C1, and ~~particularly~~ radially inward of the transmitting

member 230, that transmits the output thereof. Further, ~~the~~ brake B2 is ~~configured on~~ located around the outer circumferential side of the clutch C2, and the brake B1 is ~~configured on~~ located around the outer circumferential side of the first planetary gear unit PU.

~~Continuing, based on the above mentioned construction,~~ the operations of the automatic transmission ~~device~~ 1_{18} of the eighteenth embodiment will now be described with reference to Fig. 30, Fig. 31, and Fig. 32 below. ~~Now,~~ the vertical axis of the speed line diagram illustrated in Fig. 32 indicates the ~~revolutions~~ rpm of ~~each~~ the various rotation components, and the horizontal axis indicates the corresponding gear ratio of these rotation components. Further, ~~in regarding~~ the first planetary gear unit PU section of this speed line diagram, the vertical axis to the farthest horizontal edge (the right side of Fig. 32) corresponds to sun gear S3, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the vertical axis corresponds to the ring gear R2, the carrier CR2, and the sun gear S2. Further, ~~in regarding~~ the second planetary gear unit PR section of this speed line diagram, the vertical axis to the farthest horizontal edge (the right side of Fig. 32) corresponds to the sun gear S1, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the vertical axis corresponds to the ring gear R1 and the carrier CR1. Further, the width between these vertical axes are inversely proportional to the ~~inverse of the~~ number of teeth of each of the sun gears S1, S2, S3, and to the

~~inverse of~~ the number of teeth of each of the ring gears R1, R3. ~~Also~~ Again, the dotted line ~~in the~~ horizontal ~~direction~~ in the diagram ~~illustrate that~~ represents the rotation ~~is~~ transmitted ~~from~~ by the transmitting member 230.

As illustrated in Fig. 30, the rotation of the input shaft 2 is input to the above-mentioned sun gear ~~S2~~ S2 by engaging the clutch C2, and the ~~rotation of this~~ sun gear S2 can be fixed by ~~retaining~~ engagement of the brake B2. The rotation of the input shaft 2 is input to the ~~above-mentioned~~ carrier CR2, by engaging the clutch C3, and the ~~rotation~~ carrier CR2 can be fixed by ~~retaining~~ engagement of the brake ~~B2~~ B1. Further, rotation in one direction is controlled by the one-way clutch F1.

~~On the other hand, the above-mentioned~~ The sun gear S1 is connected to the input shaft 2, ~~and the rotation of this input shaft 2 is input, and further,~~ and receives input from the carrier CR1 is connected to the case 3 ~~and~~ whereby its rotation is fixed, and therefore the ring gear R1 rotates at a reduced ~~rotations~~ speed. Further, by engaging the clutch C1, the reduced rotations speed of ~~this~~ ring gear R1 ~~are~~ is input to the sun gear S3. Also, the rotation of the ~~above-mentioned~~ ring gear R2 is output ~~to the above-mentioned counter gear 5, and is output~~ through this counter gear 5, a counter shaft unit not illustrated, and a differential unit to the drive wheel ~~via~~.

~~At~~ In first speed forward within the D (drive) range, as illustrated in Fig. 31, the clutch C1 and the one-way clutch

F1 are engaged. Then, as illustrated in Fig. 32, the reduced speed rotations of the ring gear R1 ~~are~~ is input to the sun gear S3 via the clutch C1 and the transmitting member 230. Further, the rotation of the carrier CR2 is ~~controlled in~~ limited to one direction (the forward rotation direction) by the one-way clutch F1. ~~in other words the carrier CR2 is prevented from rotating in the opposite direction and is fixed.~~ Then, the ring gear R2 rotates ~~forward for the~~ in first speed forward, derived from the reduced speed rotations input to the sun gear S2 and the fixed state of carrier CR2, and ~~that rotation~~ this first speed forward rotation is output from the counter gear 5.

~~Now, when~~ For downshifting (when coasting), the brake B1 is ~~obtained and~~ engaged to fix the carrier CR2 ~~is fixed~~, and the above-~~mentioned~~ described state of first speed forward is maintained while preventing ~~the~~ forward rotation of ~~this~~ carrier CR2. Further, ~~at this~~ in first speed forward, the one-way clutch F1 prevents the carrier CR2 from reverse rotation ~~in the opposite direction and allows forward rotation~~, and therefore, switching from a non-driving range to a driving range and ~~achieving the~~ establishing first speed forward can be accomplished more smoothly by the automatic ~~engaging~~ engagement of the one-way clutch. In this ~~case~~ first speed forward, because the sun gear S3 and the ring gear R1 are rotating at a reduced ~~rotation~~ speed, the ~~above mentioned~~ transmitting member 230 ~~performs~~ transmits a relatively large torque, ~~transmission~~.

~~At~~ In second speed forward within the D (drive) range, as

illustrated in Fig. 31, the clutch C1 ~~is engaged~~ and the brake B2 ~~is retained~~ are engaged. Then, as illustrated in Fig. 32, the reduced speed rotations of the ring gear R1 ~~are~~ is input to the sun gear S3 via the clutch C1 and the transmitting member 230, and the rotation of the sun gear S2 is fixed by the brake B2. By doing so, the carrier CR2 rotates at a slightly reduced speed ~~rotations slightly~~, and ~~from~~ driven by the reduced speed rotations input to the sun gear S3 and ~~this~~ the slightly reduced speed rotation of the carrier CR2, the ring gear R2 rotates ~~forward for the~~ at second speed forward, ~~and this~~ which rotation is output to the counter gear 5. ~~Now,~~ Also in this case, because the sun gear S3 and the ring gear R1 are rotating at a reduced speed ~~rotation~~, the ~~above-mentioned~~ transmitting member 230 ~~performs~~ transmits a relatively large torque ~~transmission~~.

~~At~~ In third speed forward within the D (drive) range, as illustrated in Fig. 31, the clutch C1 and the clutch C2 are engaged. Then, as illustrated in Fig. 32, the reduced speed rotations of the ring gear R1 is input to the sun gear S3 via the clutch C1 and the transmitting member 230, and also the rotation of the input shaft 2 is input to the sun gear S2 by engaging the clutch C2. Further, ~~by~~ with the rotation of the input shaft 2 input to the sun gear S2 and ~~by~~ the reduced speed rotation of the sun gear S3, the ~~fixed~~ carrier CR2 has slightly ~~greater reduced rotations~~ slower speed than the ~~reduced rotations of this~~ sun gear S3. Further, from the input

rotation of the sun gear S2 and the reduced speed rotations of the sun gear S3, the ring gear R2 is rotated at ~~forward for~~ third speed forward, and this rotation is output from the counter gear 5. In this case also, because the sun gear S3 and the ring gear R1 are rotating at a reduced speed, the ~~above-mentioned~~ transmitting member 230 transmits a relatively large torque, ~~transmission.~~

In ~~At~~ fourth speed forward within ~~the~~ D (drive) range, as illustrated in Fig. 31, the clutch C1 and the clutch C3 are engaged. Then, as illustrated in Fig. 32, the reduced speed rotations of the ring gear R2 is input to the sun gear S3 via the clutch C1 and the transmitting member 230, and also the rotation of the input shaft 2 is input to the carrier CR2 via the clutch C3. Then, driven by the rotation of input shaft 2 input to the carrier CR2 and by the reduced speed rotations of the sun gear S3, the ring gear R2 rotates at T ~~forward for~~ fourth speed forward, and this rotation is output from the counter gear 5. In this case also, because the sun gear S3 and the ring gear R1 are rotating at a reduced speed, the ~~above-mentioned~~ transmitting member 230 transmits a relatively large torque, ~~transmission~~.

In ~~At~~ fifth speed forward within the D (drive) range, as illustrated in Fig. 31, the clutch C2 and the clutch C3 are engaged. Then, as illustrated in Fig. 32, the rotation of input shaft 2 is input to the carrier CR2 via the clutch C3,

and also the rotation of the input shaft 2 is input to the sun gear S2 via the clutch C2. Then, ~~from~~ with the rotation of the input shaft 2 input to the sun gear S2 and ~~the rotation of the input shaft 2 input~~ to the carrier CR2, the ring gear R2 is in a direct-connect rotating state, and rotates ~~forward for the~~ at fifth speed forward, ~~which has~~ i.e. at the same ~~rotation~~ speed as the input shaft 2, and this rotation is output from the counter gear 5.

~~At~~ In sixth speed forward within the D (drive) range, as illustrated in Fig. 31, the clutch C3 ~~is engaged~~ and the brake B2 ~~is retained~~ are engaged. Then, as illustrated in Fig. 32, the rotation of the input shaft 2 is input to the carrier CR2 via the clutch C3, and ~~rotation of~~ the sun gear S2 is fixed by ~~retaining~~ engagement of the brake B2. Then, ~~from~~ with the rotation of the input shaft 2 input to the carrier CR2 and ~~from~~ the ~~fixed~~ sun gear S2, fixed the ring gear R2 rotates at ~~overdrive rotations for~~ sixth speed forward, and this rotation is output from the counter gear 5.

~~At~~ In first speed reverse within the R (reverse) range, as illustrated in Fig. 31, the clutch C2 ~~is engaged~~ and the brake B1 ~~is retained~~ are engaged. Then, as illustrated in Fig. 32, the rotation of the input shaft 2 is input to the sun gear S2 by engaging the clutch C2, and ~~also the rotation of~~ the carrier CR2 is fixed by ~~retaining~~ engagement of the brake B1. Then, ~~from~~ with the rotation of the input shaft 2 input to the sun gear S2 and

~~from~~ the fixed carrier CR2, the ring gear R2 rotates ~~in the opposite direction as the~~ first speed reverse, and this rotation is output to the counter gear 5.

~~At the~~ P (parking) range and ~~the~~ N (neutral) range, ~~particularly~~ clutch C1, ~~clutch~~ C2, and ~~clutch~~ C3 are released, ~~the transmission movement between the~~ input shaft 2 ~~and~~ the counter gear 5 is disconnected, and the automatic transmission ~~device~~ 1_{18} as a whole is in an idle state (neutral state).

As described above, ~~according to~~ the automatic transmission ~~device~~ 1_{18} ~~relating to the present invention~~, because the planetary gear PR and the clutch C3 ~~is~~ ~~configured~~ on one side ~~in the axial direction~~ of the planetary gear unit PU, and the clutch C2 is ~~configured~~ on the ~~other side in the~~ axial ~~direction~~ of the planetary gear unit PU, the planetary gear PR and ~~the planetary gear unit~~ PU can be ~~configured~~ closely together, as compared to ~~the case~~ wherein ~~for example~~ two clutches C2 and C3 are ~~configured in~~ between the planetary gear PR and ~~planetary gear unit~~ PU, and the transmitting member 230 ~~for transmitting reduced rotation~~ can be relatively ~~shortened~~. ~~By doing so~~, the automatic transmission can be made more compact and more lightweight. Further, because the inertia (~~force~~ inertia) can be reduced, the controllability of the automatic transmission can be increased, and the

occurrence of speed change shock can be reduced. Further, compared to ~~the case~~ an embodiment wherein three clutches C1, C2, C3 are ~~configured~~ located on one side of the first planetary gear unit PU, the oil lines (for example, 2b, 91, 93, 94) that supply the ~~oil pressure~~ hydraulic servos 11, 12, and 13 of these clutches C1, C2, C3 can be more constructed easily, ~~and~~ the manufacturing process can be simplified and the costs can be reduced ~~brought down~~.

Further, since the ~~oil pressure~~ hydraulic servo 13 is provided on the input shaft 2, one set of seal rings 82 form a seal between the case 3 and input shaft 2 ~~and~~ to supply oil through the oil line 2b provided within input shaft 2 ~~and therefore oil can be supplied~~ to the oil chamber of ~~oil pressure~~ hydraulic servo 13, without providing seal rings between, for example, the input shaft 2 and the oil pressure servo 13. Further, ~~oil pressure~~ hydraulic servos 11 and 12 can receive oil directly from the bosses ~~units~~ 3a, 3b ~~provided from the case 3~~, without passing through other components. ~~units for example, in other words, can supply oil by providing one set of seal rings 81 and 84~~. Therefore, oil can be supplied simply by providing one set of seal rings 81, 82, and 84 for each of the ~~oil pressure~~ hydraulic servos 11, 12, and 13, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, since the clutch C3 is ~~configured on the inner circumference side~~ radially inward of the clutch C1, the clutch C1, which must transmit a relatively large torque ~~in order to transmit~~ at

the reduced ~~rotation~~ speed, can be ~~configured~~ located on the outer circumference side, and this clutch C1 and the ~~oil pressure~~ hydraulic servo 11 thereof can have an increased diameter. Particularly, the pressure receiving area of the oil chamber of the oil pressure servo 11 can be enlarged, and the ~~capacity capable of~~ capacity of torque transmission of this clutch C1 can thereby be increased. By ~~configuring~~ designing the clutch C3 ~~which can~~ to have a smaller capacity ~~for~~ torque transmission as compared to the clutch C1, the automatic transmission can be made more compact.

Further, because clutch C2 ~~is a clutch that~~ engages ~~while at~~ in first speed reverse, ~~when this clutch 2 is engaged at first speed reverse~~, the hub unit 224 that connects this clutch C2 and the sun gear S2 rotates at the same ~~rotation~~ speed as the input shaft 2, ~~by engaging this clutch C2,~~ while the transmitting member 230 rotates in the opposite direction, and accordingly ~~there may be cases wherein~~ there is a great difference between the rotational speed of that of the transmitting member 230 and the hub unit 224 ~~becomes great~~, but due to ~~this~~ clutch C2 being located on the ~~opposite~~ first side of the planetary gear ~~PR, via~~ PU opposite the second planetary gear unit ~~PU~~ PR, the transmitting member 230 and the hub ~~hunt~~ 224 can be ~~configured~~ spaced apart from one another. Compared to the case wherein, for example, those parts come in to contact due to a multiple axis construction, the decreased efficiency of the automatic transmission caused by the friction produced by the relative rotation between those

parts can be ~~prevented~~ avoided.

Further, the automatic transmission ~~device~~ 1_{18} according to ~~the present~~ this eighteenth embodiment is ~~a transmission device that is directly coupled at~~ in fifth speed forward. Therefore, at first speed forward and fourth speed forward, the gear ratio can be ~~specified in a detailed manner~~ more precisely set, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine speed can be ~~utilized with better revolutions, and this contributes to increased~~ reduced and fuel economy of the vehicle while running at a low to medium speed can be improved.

~~Now, the linking member (in particular~~ The transmitting member) for linking the planetary gear units PR and ~~the planetary gear unit~~ PU requires rigidity to withstand the reduced speed torque that ~~is input~~ it transmits. For example, in the case of ~~configuring~~ a clutch that engages at a slow to medium speed ~~or~~ and a clutch that engages and disengages reduced speed rotations located on the inner circumference side of the linking member, the clutch must have a large capacity, and therefore an appropriate diameter ~~to~~ corresponding ~~with~~ to this capacity becomes necessary. Therefore, in the event that the ~~linking~~ transmitting member is the type that passes on the radially outer ~~circumference~~ side of this ~~type of~~ clutch, an even larger diameter than the ~~necessary diameter measurement of those clutches~~ becomes necessary, ~~and~~ the diameter ~~measurement~~ of the ~~linking~~ transmitting

must be further
member ~~is~~ enlarged ~~more than necessary~~, and the automatic
must have a
transmission as a whole ~~becomes~~ greater ~~in the direction of~~
~~the~~ diameter. Therefore an object of the present embodiment
minimize
is to ~~reduce the enlargement of~~ the diameter ~~measurement~~,
To thereby
and provide a compact automatic transmission.

According to the present embodiment, all clutches can
designed to avoid
be ~~configured without~~ enlarging the diameter ~~measurement~~ of
transmitting (linking) providing
the ~~linking~~ member, by ~~configuring~~ a clutch C3 with a small
radially
capacity ~~on the linking member, particularly~~ on the inner
~~circumference~~ side of the transmitting member 230.

~~1~~ Nineteenth Embodiment ~~2~~

~~Now,~~ A nineteenth embodiment, which is a partial
now
modification of the eighteenth embodiment will be described,
with reference to Fig. 33 through Fig. 36. ~~Fig. 33 is a~~
~~schematic cross-sectional diagram illustrating~~ the automatic
transmission device of an automatic transmission relating to
the nineteenth embodiment, Fig. 34 is an operational table
of an automatic transmission relating to the nineteenth
embodiment, and Fig. 35 is a speed line diagram of an
~~automatic transmission relating to the nineteenth embodiment.~~

~~Now,~~ Components of the nineteenth embodiment which are the
are
same as those of the eighteenth embodiment ~~will be~~ denoted
by
~~with~~ the same reference numerals, and description thereof will not be
repeat
~~omitted~~, except for The ~~partial~~ modifications.

As Fig. 33 illustrates, the automatic transmission

~~device~~ 1_{19} of the automatic transmission ~~relating to~~ the nineteenth embodiment ~~is a modification of~~ the configuration of the clutch C2, and further, ~~changes~~ the construction of the oil line ~~of~~ the ~~oil pressure~~ servo 12 ~~of the clutch C2,~~ as compared to ~~that of~~ the automatic transmission ~~device~~ 1_{18} of ~~the automatic transmission of~~ the eighteenth embodiment (see Fig. 30).

Within the automatic transmission ~~device~~ 1_{19}, the clutch C1 is ~~configured~~ on the planetary gear PR, ~~on the~~ opposite (left side on the diagram) ~~from~~ the planetary gear unit PU. ~~The~~ front ~~edge~~ of the inner circumference ~~side~~ of the drum ~~shaped member~~ 221 of this clutch C1 is splined ~~with~~ the friction plate 71, ~~and the inner circumference side of this friction plate 71 is~~ splined ~~with~~ the hub unit 222. The drum ~~shaped member~~ 221 is connected to the input shaft 2, and the hub unit 222 is connected to the sun gear S1 of the planetary gear PR. The side plate of the carrier CR1 of this planetary gear PR is fixed and supported by the case 3. ~~Also,~~ the ring gear R1 is connected to the transmitting member 230 ~~and this transmitting member is connected~~ to the sun gear S3. Further, the clutch C3, comprising ~~an oil servo~~ 13, ~~a~~ friction plate 73, a drum ~~shaped member~~ 225, and a hub unit 226, is ~~configured~~ so as to be enclosed within this transmitting member 230.

The oil chamber of ~~this oil pressure~~ servo 12 is linked

to an oil line 2a which is formed on the input shaft 2, and this oil line 2a ~~is provided along one edge of the case, and~~ is connected to the oil line 91 of the boss unit 3a which ~~is provided on~~ forms a sleeve around one end of the input shaft 2 ~~in a sleeve form~~, and this oil line 91 is linked to an oil pressure control unit not illustrated. Therefore, ~~regarding the above-mentioned oil pressure servo 12,~~ simply by providing one set of seal rings 81 ~~to seal~~ between the input shaft 2 and the boss ~~unit~~ 3a ~~of the case 3, an~~ oil ~~line is constructed from~~ communication is established between the oil pressure control device ~~not illustrated, to~~ and the oil chamber of the ~~oil pressure~~ hydraulic servo 12.

~~Continuing, based on the above-mentioned construction,~~ The operations of the automatic transmission ~~device~~ of the nineteenth embodiment 1_{19} will now be described with reference to Fig. 33, Fig. 34, and Fig. 35 below. ~~Now,~~ As with the ~~above-mentioned first~~ previously described embodiments, the vertical axes of the speed line diagram illustrated in Fig. 35 indicate the ~~revolutions~~ speeds of the various ~~each~~ rotation components, and the horizontal axis indicates the corresponding gear ratio of these rotation components. ~~Further, regarding~~ In the first planetary gear unit PU section of this speed line diagram, the vertical axis to the farthest horizontal edge (the right side of Fig. 35) corresponds to sun gear S3, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the vertical axes corresponds to the ring gear R2, the carrier CR2, and the sun gear S2. Further, ~~regarding~~ in the second planetary

gear PR section of this speed line diagram, the vertical axis to the farthest horizontal edge (the right side of Fig. 35) corresponds to sun gear S1, and moving to the left within the diagram, the vertical axis corresponds to the ring gear R1 and the carrier CR1. Further, the width between these vertical axes are proportional inverse of the number of teeth of each of the sun gears S1, S2, S3, and to the number of teeth of each of the ring gears R1, R3. Also, the dotted line horizontal in the diagram represents the rotation transmitted by the transmitting member 230.

As illustrated in Fig. 33, by engaging the clutch C1, the rotation of the input shaft 2 is input to the sun gear S1. Further, the carrier CR1 is fixed to the case 3, and the ring gear R1 rotates at reduced speed based on the rotation of the input shaft 2 input into sun gear S1. In other words, by engaging the clutch C1, the reduced speed rotation of the ring gear R1 is input to the sun gear S2 via the transmitting member 230.

As illustrated in Fig. 34 and Fig. 35, within the second planetary gear unit PR, in first speed forward, second speed forward, third speed forward, and fourth speed forward, the rotation of the input shaft 2 is input to the sun gear S1 by

engagement of the clutch C1, the reduced speed rotation is output to the ring gear R3 through the fixed carrier CR1, and the reduced speed rotation is input to the sun gear S3 via the transmitting member 230. At this time, the ring gear R1 and the sun gear S3 rotate at a reduced speed, and therefore the ~~above-mentioned~~ transmitting member 230 transmits a relatively large torque ~~transmission~~. On the other hand, in fifth speed forward, sixth speed forward, and first speed reverse, the rotation of the sun gear S3 is input to the ring gear R1 via the transmitting member 230, and further, because the clutch C1 is released, as illustrated in Fig. 35, the sun gear S1 rotates based on the speed of the ring gear R1 and the fixed carrier CR1.

~~Now,~~ other operations of the nineteenth embodiment are similar to those of the ~~above-described~~ eighteenth embodiment (see Fig. 31 and Fig. 32), and accordingly description thereof will be omitted.

~~As described above, according to~~ In the automatic transmission ~~device~~ 1_{19} of the nineteenth embodiment ~~relating to the present invention~~, due to the second planetary gear unit PR and the clutch C3 being ~~configured~~ located on one side ~~in the axial direction~~ of the first planetary gear unit PU, and the clutch C2 being ~~configured~~ on ~~the other side in~~ the axial ~~direction~~ opposite side of the first planetary gear units PR and ~~the planetary gear unit~~ PU can be ~~configured~~ located more closely together, as compared to

an embodiment
the ~~case~~ wherein, for example, two clutches C2 and C3 are
located units
~~configured in~~ between the planetary gear PR and ~~planetary gear unit~~ PU, and the transmitting member 230 ~~for transmitting reduced rotation~~ can be made relatively shorter. By doing so, the automatic transmission can be made more compact and more lightweight. Further, because the inertia (force ~~of~~ inertia) can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced. Further, compared to the case wherein three clutches C1, C2, C3 are
located first
~~configured~~ on one side of the planetary gear unit PU, the oil lines (for example, 2a, 2b, 91, 93, 94) that supply the
hydraulic
~~oil pressure~~ servos 11, 12, and 13 of these clutches C1, C2, C3 can be constructed more easily, ~~and~~ the manufacturing process can be simplified and the costs can be reduced ~~brought down~~.

Further, since the ~~oil pressure~~ hydraulic servos 12, 13 are provided on the input shaft 2, one set of seal rings 81 and
form a with for through
82 seal the case 3 ~~and~~ supply oil ~~to~~ the oil lines 2a and 2b ~~provided~~ within input shaft 2, ~~and therefore oil can be supplied~~ to the oil chambers of oil pressure servos 12, 13, without providing the paired seal rings between, for example, the input shaft 2 and the ~~oil pressure~~ hydraulic servos 12, 13. Further, the ~~oil pressure~~ hydraulic servo 11 can receive supply oil directly from the boss ~~unit~~ 3b ~~extended from the case 3~~, without passing through other ~~parts for example~~ components, and therefore ~~can~~ the supply oil can be connected by providing

one set of seal rings 84. Therefore, oil can be supplied ~~simply by providing one~~ through sets of seal rings 81 and 82, 84 ~~each~~ for the oil pressure servos 11, 12, and 13, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, since the clutch C2 ~~is a clutch that~~ engages ~~while at~~ for first speed reverse, when this clutch 2 is engaged ~~at~~ in first speed reverse, the hub unit 224 that connects this clutch C2 and the sun gear S2 rotates at the same ~~rotation~~ speed as the input shaft 2, ~~by engaging this clutch C2,~~ while the transmitting member 230 rotates in the opposite direction, and there ~~may be cases wherein the rotation~~ fore speed difference ~~of~~ between the transmitting member 230 and the hub unit 224 ~~becomes~~ is ~~great, but~~ large, However, since ~~this~~ clutch C2 is located on the ~~opposite~~ first side of the planetary gear unit PU, ~~via~~ opposite the second planetary gear unit PR, the transmitting member 230 and the hub ~~unit~~ 224 can be ~~configured~~ spaced apart from one another. Compared to the case wherein, for example, those parts come in contact ~~due to~~ in a multiple axis construction, the ~~decreased~~ loss of efficiency of the automatic transmission caused by the friction produced by the relative rotation between those parts can be ~~prevented~~ avoided.

~~Further, in the event that~~ If the clutch C1 ~~is~~ were to be placed between the ring gear R1 and the sun gear S3, for example, the reduced speed rotation must be engaged and disengaged, and a larger clutch

C1 would be required. However, the clutch C1 ~~becomes relatively large, but~~ by placing between the input shaft 2 and the sun gear S1, the engaging and disengaging of the rotation of the input shaft 2 ~~from~~ by this clutch C1 indirectly ~~causes~~ the reduced speed rotation output from the ring gear R1 of the second planetary gear unit PR to be engaged and disengaged, ~~and~~ the clutch C1 can be made more compact, and therefore the automatic transmission can be made more compact.

Further, because the automatic transmission ~~device~~ 1_{19} according to the ~~present~~ nineteenth embodiment is ~~a transmission device that is~~ directly coupled ~~at~~ in fifth speed forward, ~~Therefore, at~~ in first speed forward and fourth speed forward, the gear ratio can be ~~specified in a detailed manner~~ more precisely set for optimum efficiency, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine can be ~~utilized with better revolutions, and this contributes to increased~~ operated more efficiently and fuel economy of the vehicle while running at a low to medium speed can also be increased.

~~Now, the linking member (in particular~~ The transmitting members ~~for~~ which link the planetary gear units PR and ~~the planetary gear unit~~ PU requires rigidity to withstand the reduced speed torque that is input. ~~For example,~~ In the case of ~~configuring~~ a clutch that engages at a slow to medium speed and in the case of ~~or~~ a clutch that engages and disengages at reduced speed and is located ~~rotations~~ on ~~the inner circumference side~~ radially inward of the ~~linking~~ transmitting member, the clutches must have a large capacity and therefore are large

~~appropriate~~ diameter to ~~correspond with this~~ provide the required capacity ~~becomes necessary.~~ Therefore, in the event that the ~~linking~~ transmitting member ~~is the type that~~ passes on the radially outer ~~circumference~~ side of ~~this type of~~ such a clutch, ~~even a larger diameter than~~ the necessary diameter ~~measurement of those~~ for the clutch~~es~~ becomes even larger necessary, ~~and~~ the diameter ~~measurement~~ of the ~~linking~~ transmitting member is enlarged more than necessary, and the automatic transmission as a whole ~~becomes~~ has a greater ~~in the direction of the~~ diameter. Therefore an object of the present embodiment is to ~~reduce the~~ avoid the need for enlargement of the diameter ~~measurement~~, and provide a more compact automatic transmission.

~~According to the present~~ In this nineteenth embodiment, all clutches can be configured ~~without~~ so as to avoid enlarg~~ing~~ ment of the diameter ~~measurement~~ of the ~~linking~~ to member, ~~by configuring a~~ because clutch C3 with a small capacity ~~on the linking member, particularly on the inner circumference side~~ is provided radially inward of the transmitting member 230.

~~Twentieth~~ Embodiment

~~Below,~~ The twentieth embodiment, which is a partial modification of the eighteenth embodiment will now be described, with reference to Fig. 36 through Fig. 38. ~~Fig. 36 is a schematic cross-sectional diagram illustrating~~ the automatic transmission device of an automatic transmission relating to the twentieth embodiment, Fig. 37 is an operational table of an automatic transmission relating to the twentieth embodiment, ~~and Fig. 38 is a speed line diagram of an~~

~~automatic transmission relating to the twentieth embodiment~~. ~~Now~~, Components of the twentieth embodiment which are the same as those of the eighteenth embodiment ~~will be~~ are denoted ~~with~~ by the same reference numerals, and description thereof omitted, except for ~~partial~~ the modifications.

As Fig. 36 illustrates, the automatic transmission ~~device~~ 1_{20} of the ~~automatic transmission relating to the~~ twentieth embodiment comprises a brake B3 instead of a clutch C1, and enables the carrier CR1 of the planetary gear PR to be fixed by the brake B3, and further, ~~changes the~~ differs from the eighteenth embodiment in the construction of the oil line ~~of~~ for the ~~oil pressure~~ hydraulic servo 12 of the second planetary gear unit PR. ~~compared to that of the automatic transmission device 1_{18} of the automatic transmission of the eighteenth embodiment (see Fig. 30).~~

Within this automatic transmission ~~device~~ 1_{20}, the brake B3 is ~~configured~~ located on the side of the second planetary gear unit PR, on the opposite (left side on the diagram) ~~from~~ the first planetary gear unit PU. This brake B3 comprises ~~an oil pressure~~ a hydraulic servo 16, a friction plate 76, and a hub unit 233.

The hub unit 233 of ~~this~~ brake B3 is connected to the side plate on one side of the carrier CR1, and this carrier CR1 is rotatably supported by the input shaft 2 or the boss unit 3a, ~~so as to be capable of rotating. Further,~~ The sun gear S1 is connected to the input shaft 2. ~~Also, this~~ Ring gear R1 is connected to the ~~transmitting member 230, and is connected~~

~~to the~~ sun gear S3 via ~~this~~ transmitting member 230.

The oil chamber of ~~this oil pressure~~ the hydraulic servo 12 is ~~linked~~ connected to an oil line 2a which is formed on the input shaft 2, ~~and~~ This oil line 2a ~~is provided along one edge of the case, and~~ in turn, is connected to the oil line 91 of ~~the boss unit 3a which is provided on the input shaft 2 in a sleeve form, and this oil line 91 is linked~~ which is connected to an oil pressure control unit not illustrated. Therefore, ~~regarding the above-mentioned oil pressure~~ for hydraulic servo 11, simply by providing one set of seal rings ~~81 to seal~~ between the input shaft 2 and the boss unit 3a of the case 3, ~~an~~ the supply oil ~~line~~ is ~~constructed~~ connected from the oil pressure control device ~~not illustrated~~ to the oil chamber of the ~~oil pressure~~ hydraulic servo 12.

~~Continuing, based on the above-mentioned construction,~~ ~~the~~ Operations of ~~an~~ the automatic transmission ~~device~~ 1_{20} of the twentieth embodiment will now be described with reference to Fig. 36, Fig. 37 and Fig. 38 ~~below.~~ Now, as with the ~~above-mentioned first~~ previously described embodiment, the vertical axis of the speed line diagram illustrated in Fig. 38 indicates the ~~revolutions~~ respective speeds of ~~each rotation~~ the various rotary component, and the horizontal axis ~~indicates~~ represents the corresponding gear ratio of these ~~rotation~~ ry components. ~~Further, regarding~~ In the first planetary gear unit PU section of this speed line diagram, the vertical axis to the farthest horizontal edge (the right side of Fig. 38) corresponds to sun gear S3, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the

vertical axis corresponds to the ring gear R2, the carrier CR2, and the sun gear S2. Further, ~~regarding~~ the planetary gear PR section of this speed line diagram, the vertical axis to the farthest horizontal edge (the right side of Fig. 38) corresponds to sun gear S1, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the vertical axis corresponds to the ring gear R1 and the carrier CR1. Further, the width between these vertical axes are proportional to ~~the inverse of~~ the number of teeth of each of the sun gears S1, S2, S3, and to the ~~inverse of the~~ number of teeth of each of the ring gears R1, R3. Also, the dotted line ~~in~~ the horizontal ~~direction~~ in the diagram ~~illustrate that~~ the rotation is transmitted from the transmitting member 230.

As Fig. 36 illustrates, by ~~retaining~~ the brake B3, the ~~above-mentioned~~ carrier CR1 is fixed ~~as~~ to the case 3. Further, the rotation of the input shaft 2 is input to the sun gear S1, and the ~~above-mentioned~~ ring gear R1 rotates at reduced ~~rotations based on the rotation of input shaft 2 which is input to this sun gear S1,~~ because this carrier CR1 is fixed. In other words, by engaging the brake B3, the reduced rotation of the ring gear R1 is input to the sun gear S3 via the transmitting member 230.

~~By doing so~~, as Fig. 37 and Fig. 38 illustrate, ~~regarding~~ the planetary gear PR, ~~at~~ first speed forward,

second speed forward, third speed forward, and fourth speed forward, the rotation of the input shaft 2 is input to the sun gear S1 by ~~retaining~~ engaging the brake B3, the carrier CR1 is fixed, ~~and~~ the reduced speed rotation is output to the ring gear R3 by the rotation of the sun gear S1 ~~wherein the rotation of the input shaft 2 is input~~, and the reduced speed rotation is input to the sun gear S3 via the transmitting member 230. In this case, the ring gear R1 and the sun gear S3 are rotating at reduced speed, and therefore the ~~above-mentioned~~ transmitting member 230 transmits ~~performs~~ a relatively large torque ~~transmission.~~ On the other hand, ~~at~~ in fifth speed forward, forward speed level, and first speed reverse, the rotation of the sun gear S3 is input to the ring gear R1 via the transmitting member 230, and further, because the brake B3 is released, as Fig. 38 illustrates, the carrier CR1 rotates ~~based on each the rotation~~ with the speed ~~level~~ of ~~this~~ ring gear R1 and the sun gear S1 ~~of the rotation of the input shaft 2~~.

~~Now,~~ The operations ~~other than these~~ of the ~~above-mentioned~~ second unit planetary gear are similar to those of the ~~above-described~~ eighteenth embodiment, and accordingly description thereof will be omitted.

As described above, ~~according to~~ in the automatic transmission ~~device~~ 1_{20} of the twentieth embodiment, ~~relating to the present invention~~, due to the second unit planetary gear PR and the clutch C3 being

~~configured~~ located on one side ~~in the axial direction~~ of the first planetary gear unit PU, and the clutch C2 being ~~configured~~ located on the ~~other side in the~~ axial ~~direction~~ opposite side of the first planetary gear units PR and ~~the planetary gear unit~~ PU can be ~~configured~~ located more closely together, as compared to ~~the case~~ an embodiment wherein, for example, two clutches C2 and C3 are ~~configured in~~ located between the planetary gear units PR and ~~planetary gear unit~~ PU, and the transmitting member 230 for transmitting reduced speed rotation can be made relatively ~~shortened~~ shorter. ~~By doing so~~, In this manner, the automatic transmission can be made more compact and more lightweight. Further, because the inertia (force ~~of~~ inertia) can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced.

Further, since the ~~oil pressure~~ hydraulic servos 11 and 12 are ~~provided~~ mounted on the input shaft 2, one set of seal rings 81 and 82 ~~seal the case 3 and~~ serves to supply oil ~~to~~ from the oil lines 2a and 2b provided within input shaft 2, ~~and therefore oil can be supplied~~ to the oil chambers of ~~oil pressure~~ hydraulic servos 12, 13 without providing seal rings between, for example, the input shaft 2 and the ~~oil pressure~~ hydraulic servos 12, 13. Therefore, oil can be supplied simply by providing one set of seal rings 81 and 82 for each of the ~~oil pressure~~ hydraulic servos 12, 13, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can

be improved.

Further, ~~since~~ when the clutch C2 ~~is a clutch that engages while at first speed reverse, when this clutch 2~~ is engaged ~~at~~ in first speed reverse, the hub unit 224 that connects this clutch C2 and the sun gear S2 rotates at the same ~~rotation~~ speed as the input shaft 2, Accordingly, by engaging ~~this~~ clutch C2, while the transmitting member 230 is rotating in the opposite direction, ~~and there may be cases wherein~~ will cause the ~~rotation difference~~ speeds of the transmitting member 230 and the hub unit 224 become to be different great, but because ~~this~~ clutch C2 is located on the ~~opposite~~ first side of the planetary gear unit PU opposite ~~PR, via~~ the second planetary gear unit PR, the transmitting member 230 and the hub ~~hunt~~ unit 224 can be ~~configured~~ spaced apart from one another. Compared to the case wherein, for example, those ~~parts~~ components come in contact ~~due to~~ in a multiple axis construction, the decreased efficiency of the automatic transmission caused by the friction produced by the relative rotation between those ~~parts~~ components can be ~~prevented~~ avoided.

Further, since the reduced rotation ~~output~~ speed to the first planetary gear unit PU from the second planetary gear unit PR is ~~made to be engaged and disengaged~~ controlled by engagement of the brake B3, the number of ~~parts~~ components (for example drum-shaped members and so forth) can be reduced as compared to ~~the case~~ an embodiment wherein, for example, a clutch C1 is ~~provided~~ employed. Further, the brake B3 can ~~configure an~~ receive a supply of oil ~~line~~ directly from the case 3, and therefore the configuration of the oil line can be simplified as compared

to the case wherein, for example, a clutch C1 is ~~provided~~ employed.

Further, the automatic transmission ~~device~~ 1_{20} according to the ~~present~~ twentieth embodiment is ~~a transmission device that is~~ directly coupled at fifth speed forward. Therefore, ~~at~~ in first speed forward and fourth speed forward, the gear ratio can be ~~specified in a detailed manner~~ such as to provide greater efficiency, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine can be ~~utilized with better revolutions~~ operated more efficiently, and ~~this contributes to increased~~ fuel economy of the vehicle while running at a low to medium speed is increased.

~~Now, the linking member (in particular~~ In this embodiment also, the transmitting ~~member) for~~ which links the planetary gear units PR ~~and the planetary gear unit~~ PU requires rigidity to withstand the reduced speed torque that is input. For example, in the case of ~~configurring~~ a clutch that engages at a slow to medium speed ~~or~~ and a clutch that engages ~~and disengages~~ to transmit reduced speed rotations and that is located on the inner ~~circumference~~ side of the ~~linking~~ transmitting member, the clutches must have a large capacity and, therefore, ~~an appropriate~~ a large diameter to provide the necessary capacity ~~becomes necessary~~. Therefore, in the event that the ~~linking~~ transmitting member ~~is the type that~~ passes on the radially outer ~~circumference~~ side of ~~this type of~~ such a clutch, even a larger diameter, ~~than the necessary diameter measurement~~ of these clutches becomes necessary, ~~and~~ the diameter ~~measurement~~ of the ~~linking~~ transmitting

member is enlarged more than necessary, and the automatic transmission as a whole ~~becomes~~ has a greater ~~in the direction of the~~ diameter. Therefore an object of the present embodiment is to ~~reduce the~~ avoid enlargement of the diameter ~~measurement~~, and to provide a compact automatic transmission.

According to ~~the present~~ this twentieth embodiment, all clutches can be configured without enlarging the diameter ~~measurement~~ of the ~~linking~~ transmitting member, ~~by configuring~~ because a clutch C3 with a small capacity ~~on the linking member, particularly~~ is provided on the inner ~~circumference~~ side of the transmitting member 230.

~~Twenty-first Embodiment~~

~~Below, the~~ A twenty-first embodiment, ~~which~~ and is a partial modification of the eighteenth embodiment will be described, with reference to Fig. 39. ~~Fig. 39 is a schematic cross-sectional diagram illustrating~~ the automatic transmission device of ~~an automatic transmission relating to the twenty-first embodiment. Now,~~ Components of the twenty-first embodiment which are the same as those of the eighteenth embodiment ~~will be~~ are denoted ~~with~~ by the same reference numerals, and description thereof will be omitted here, except for ~~partial~~ modified components.

As Fig. 39 illustrates, the automatic transmission device 1_{21} of the ~~automatic transmission relating to the~~ twenty-first embodiment ~~is a modification of the~~ differs from the eighteenth embodiment in the configuration of the clutch C1 and the second planetary gear unit PR. More in that of

in the diagram

specifically, second unit

~~other words~~, the planetary gear PR and the clutch C1 are ~~configured~~ on the right side ~~of the diagram~~ of the planetary gear unit PU, and the counter gear 5 is ~~configured in~~ located between ~~this~~ the planetary gear units PR and ~~the planetary gear unit~~ PU_9 ~~compared to that of the automatic transmission device~~ 1_{18} ~~of the automatic transmission of the eighteenth embodiment~~ (see Fig. 30).

Within the automatic transmission ~~device~~ 1_{21} is ~~on the radially inner circumference side of the input shaft 2 is configured~~ a hydraulic multi-disc clutch C1 comprising ~~an oil pressure~~ servo 11, ~~a~~ friction plates 71, a clutch drum ~~shaped member~~ 221 ~~that forms a clutch drum~~, a hub unit 222 connected to a sun gear S3, and ~~on the outer circumference side is comprised~~ radially outward of clutch C1 is a multi-disc clutch C2 comprising ~~an oil pressure~~ hydraulic servo 12, friction plates 72, a clutch drum ~~shaped member~~ 223 ~~that forms a clutch drum~~, and a hub unit 224. Further, ~~on the outer circumference side of~~ radially outward of the hub ~~unit~~ 224 is located ~~comprised~~ a multi-disc brake B2 comprising ~~an oil pressure~~ a hydraulic servo 15 and friction plates 75.

The ~~above mentioned~~ input shaft 2 is rotatably supported by the ~~above mentioned~~ clutch drum ~~shaped member~~ 221 ~~so as to be capable of rotating~~, and ~~on the~~ a front edge portion of the inner circumference ~~side~~ tial surface of this drum ~~shaped member~~ 221 is ~~configured~~ splined to the friction plates 71 of the clutch C1, which ~~is capable of engaging by the oil pressure servo 11 for the clutch C, splined, and is connected so that the inner~~ friction plates 71

~~circumference side of the~~ are intermeshed with friction plate ~~71 of this clutch C1 is~~ splined to the hub unit 222.

Further, the sun gear S1 is fixed and supported by the ~~above-mentioned~~ boss ~~unit~~ 3a, and the carrier CR1 is connected to the input shaft 2 via ~~the~~ a side plate. The ring gear 1 is rotatably supported by the boss ~~unit~~ 3a ~~so as to be capable of rotating~~, and also is connected to the ~~above-mentioned~~ clutch drum ~~shaped member~~ 221. Further, the ~~above-mentioned~~ hub unit 222 is connected to the ~~transmitting member 230, and this~~ sun gear S3 by transmitting member, ~~230 is connected to the above-mentioned sun gear S3.~~

Now, the oil chamber of the ~~oil pressure~~ hydraulic servo 11 is ~~linked~~ connected to the oil line 2a which is formed on the ~~above-mentioned~~ input shaft 2, and ~~this oil line 2a~~ is ~~linked~~ connected to the oil line 91 in the boss ~~unit~~ 3a ~~provided on the input shaft 2 in a sleeve form, and this oil line 91 is linked~~ which, in turn, is connected to the oil pressure control device, ~~not illustrated~~. This ~~oil pressure~~ hydraulic servo 11 comprises one set of seal rings 81 ~~that seal~~ between the boss ~~unit~~ 3b of the case 3 and the input shaft 2, and one set of seal rings 85 ~~that seal~~ between the input shaft 2 and the clutch drum ~~shaped member~~ 221, ~~in other words, uses~~ Thus, two sets of seal rings ~~and constructs an~~ connect oil ~~line~~ supply from the oil pressure control device ~~not illustrated~~ to the oil chamber of the ~~oil pressure~~ hydraulic servo 11.

~~On the other hand, on~~ At the other ~~side~~ end of the input shaft

2 (left side in diagram) is ~~configured~~ a multi-disc clutch C that comprises ~~an oil pressure~~ a hydraulic servo 13, friction plates 73, a drum~~-shaped member~~ clutch 225 ~~that forms a clutch drum~~, and a hub unit 226. The friction plates 73 ~~is~~ are splined ~~with the~~ to a front edge portion of the inner ~~circumference side~~ surface of the drum~~-shaped member~~ clutch 225 of this clutch C3, and ~~this~~ friction plates 73 ~~is~~ are intermeshed with friction plates splined ~~with~~ to the front edge of the outer circumference~~-side~~ tial surface of the hub unit 226, and this hub unit 226 is connected to the side plate of the carrier CR2.

The oil chamber of ~~this oil pressure~~ servo 13 is connected to an oil line 2b which is formed on the above-mentioned input shaft 2, and this oil line 2b ~~is provided along the edge of the case 3 that is the opposite side of that of the above-mentioned boss unit 3a, and~~ is connected to the oil line 93 of the boss ~~unit~~ 3b, which ~~is provided on~~ boss 3b forms a sleeve around one end of the input shaft 2, ~~in a sleeve form~~. Therefore, an oil line from the oil pressure control unit, not illustrated, to the oil chamber of the ~~oil pressure~~ hydraulic servo 13 is constructed ~~on the above-mentioned oil pressure servo 13~~, simply by providing one set of seal rings 82 ~~to seal~~ between the boss ~~unit~~ 3a of the case 3 and the drum~~-shaped member~~ clutch 225.

~~On the other hand,~~ on the radially outer ~~circumference~~ side of the planetary gear unit PU is ~~configured~~ a multi-disc brake B1 comprising ~~an oil pressure~~ a hydraulic servo 14, friction plates 74, and a hub unit 228. The side plate of the carrier CR2 of

the ~~above-mentioned~~ first planetary gear unit PU is connected to the hub unit 228 that is splined to friction plates, intermeshed with the friction plates 74 of the ~~above-mentioned~~ brake B1, and further, the hub unit 228 is connected to the inner race of the one-way clutch F1. The sun gear S3 is meshed with the short pinion PS of this carrier CR2 and ~~then~~ the long pinion PL of this carrier CR2 is meshed with the ~~above-mentioned~~ sun gear S2 and the ring gear 2. ~~and to~~ One edge of this ring gear R2 is connected to ~~the linking member 227, and this ring gear R2 is linked to~~ the counter gear 5 via ~~this linking~~ transmitting member 227.

The operations of the automatic transmission ~~device~~ 1_{21} ~~based on the above-mentioned construction are as follows.~~ differs from those of the eighteenth embodiment in that, within the second planetary gear unit PR, the carrier CR1 and the sun gear S1 have switched positions. In other words, the sun gear S1 is fixed, and the rotation of the input shaft 2 is input to the carrier CR1, but the other ~~parts~~ components are the same as those of the eighteenth embodiment (see Fig. 31 and Fig. 32), and according description will be omitted.

~~As described above, according to~~ In the automatic transmission device 1_{21} ~~relating to the present invention~~ of the twenty-first embodiment, due to the planetary gear PR and the clutch C2 being ~~configured~~ located on one side ~~in the axial direction~~ of the planetary gear unit PU, and the clutch C3 being ~~configured~~ located on the other axial side ~~in the axial direction~~ of the first planetary gear units PU, the planetary gear PR and ~~the planetary gear~~

~~unit~~ PU can be ~~configured~~ located more closely together, as compared to ~~the case~~ an embodiment wherein, for example, two clutches C2 and C3 are ~~configured in~~ located between the planetary gear units PR and ~~planetary gear unit~~ PU, and the transmitting member 230 ~~for~~ which transmitting reduced speed rotation can be made relatively ~~shortened~~. By doing so, the automatic transmission can be made more compact and more lightweight. Further, because the inertia (force ~~of~~ inertia) can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced. Further, compared to the case wherein three clutches C1, C2, C3 are ~~configured~~ located on one side of the planetary gear unit PU, the oil lines (for example, 2a, 2b, 91, 92, 93) that supply the ~~oil pressure~~ hydraulic servos 11, 12, and 13 of these clutches C1, C2, C3 can be constructed easily, ~~and~~ the manufacturing process can be simplified and the costs ~~brought down~~ can be reduced.

Further, since the counter gear 5 is ~~configured in the axial direction~~ located between the planetary gear unit PU and ~~the planetary gear~~ PR, the counter gear 5 can be ~~configured~~ located in approximately the center ~~in the~~ axial ~~direction~~ of the automatic transmission. For example, when the automatic transmission is mounted on the vehicle, need for enlarging towards one direction ~~of the axis~~ (particularly in the rear direction when the ~~input~~ side facing ~~from~~ the drive source is the front ~~direction~~) can be ~~prevented~~ avoided because the counter gear 5

is mounted ~~to match~~ adjacent the drive wheel transmission device. Because of this, particularly in the case of an FF vehicle, ~~the~~ interference ~~toward~~ with the front wheels is reduced, and the mountability on a vehicle can be improved such ~~as~~ that the steering angle ~~being~~ can be greatly increased, for example.

Further, the automatic transmission ~~device~~ 1_{21} ~~according to the present embodiment is a transmission device that~~ is directly coupled ~~at~~ in fifth speed forward. Therefore, ~~at~~ in first speed forward and fourth speed forward, the gear ratio can be specified ~~in a detailed manner~~ for better efficiency, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine can be ~~utilized with better revolutions~~ operated more efficiently, and ~~this contributes to increased~~ fuel economy ~~of the vehicle~~ is increased while running at a low to medium speed.

~~A~~ Twenty-second Embodiment

~~Below,~~ A twenty-second embodiment, which is a partial modification of the twenty-first embodiment, will now be described with reference to Fig. 40. Fig. 40 is a schematic cross-sectional diagram illustrating the automatic transmission ~~device of an automatic transmission relating to~~ of the twenty-second embodiment. ~~Now,~~ Components of the twenty-second embodiment which are the same as those of the twenty-first embodiment ~~will be~~ are denoted ~~with~~ by the same reference numerals, and description thereof omitted, except

for ~~partial~~ modifications.

As Fig. 40 illustrates, the automatic transmission ~~device~~ 1_{22} of the ~~automatic transmission relating to the~~ twenty-second embodiment ~~is a modification of the~~ configuration of the planetary gear PR and the clutch C2, and further ~~comprised~~ a brake B3 instead of clutch C1, and enables the carrier CR1 of the planetary gear PR to be fixed by the brake B3, ~~compared to that of the automatic transmission device 1_{21} of the automatic transmission of the twenty first embodiment (see Fig. 39)~~.

Within this automatic transmission ~~device~~ 1_{22}, the brake B3 is ~~configured~~ on the ~~opposite~~ side (the right side of the diagram) of the planetary gear unit PU of the planetary gear PR. This brake B3 comprises ~~an oil pressure~~ servo 16, friction plate 76, and a hub unit 233, ~~and this~~ hub unit 233 is connected to the sun gear S1 ~~in the form of being~~ supported by the boss ~~unit~~ 3a, ~~so as to be capable of rotating.~~ Further, the clutch C2 comprising ~~an oil pressure~~ servo 12, friction plate 72, a ~~drum-shaped member~~ 223, and a hub unit 224 is ~~configured~~ on the outer ~~circumference~~ side of the hub unit 233 of ~~this~~ brake B3. The ~~drum-shaped member~~ 223 of this clutch C2 is connected to one side plate of the carrier CR1, and the other side plate of ~~this~~ carrier CR1 is connected to the input shaft 2. Also, the ring gear R1 is ~~connected to the transmitting member 230, and is~~

connected to the sun gear S3 via ~~this~~ transmitting member 230.

~~Now,~~ the oil chamber of the ~~oil pressure~~ hydraulic servo 12 is linked to the oil line 91 of the boss ~~unit~~ 3a provided on the input shaft 2 in a sleeve form, via an oil hole (not illustrated) formed in the hub unit 233, and this oil line 91 is linked to the oil pressure control device, ~~not illustrated~~. This ~~oil pressure~~ hydraulic servo 11 comprises one set of seal rings 80 ~~that seal~~ between the boss ~~unit~~ 3a of the case 3 and the hub unit 233, and one set of seal rings 86 ~~that seal~~ between the hub unit 233 and the drum ~~shaped~~ member 223. In other words, ~~uses~~ two sets of seal rings ~~and~~ constructs an oil line from the oil pressure control device ~~not illustrated~~ to the oil chamber of the ~~oil pressure~~ hydraulic servo 12.

The ~~operations of the~~ automatic transmission ~~device~~ 1_{22} of this twenty-second embodiment differ from that of the twentieth embodiment ~~based on the above mentioned construction are as follows:~~

In that within the second planetary gear unit PR, the carrier CR1 and the sun gear S1 have switched positions, in other words, the sun gear S1 is fixed by the brake B3, and the rotation of the input shaft 2 is input to the carrier CR1, but the other components are the same as those of the twentieth embodiment (see Fig. 37 and Fig. 38), and according to description thereof will be omitted.

~~As described above, according to~~ In the automatic

transmission ~~device~~ 1_{22} ~~relating to the present invention~~, of the twenty-second embodiment, due to the second planetary gear unit PR and the clutch C2 being ~~configured~~ located on one side ~~in the axial direction~~ of the planetary gear unit PU, and the clutch C3 being ~~configured~~ located on the ~~other~~ axially opposite side ~~in the axial direction~~ of the first planetary gear units PU, the planetary gear unit PR and ~~the planetary gear unit~~ PU can be ~~configured~~ located more closely together, as compared with ~~the case~~ an embodiment wherein, for example, two clutches C2 and C3 are ~~configured in~~ located between the planetary gear units PR and ~~planetary gear unit~~ PU, and the transmitting member 230 for transmitting reduced speed rotation can be made relatively shorter. By doing so, the automatic transmission can be made more compact and more lightweight. Further, because the inertia (force ~~of~~ inertia) can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced.

Further, since the counter gear 5 is ~~configured in the axial direction~~ located between the first planetary gear unit PU and the second planetary gear unit PR, the counter gear 5 can be ~~configured~~ located in approximately the center ~~in the~~ axial ~~direction~~ of the automatic transmission. For example, when the automatic transmission is mounted on the vehicle, ~~enlarging towards~~ enlargement in one direction ~~of the axis~~ (particularly in the rear direction when the ~~input~~ side facing ~~from~~ the drive source is the front ~~direction~~) can be prevented because the counter gear 5

is mounted ~~to match~~ adjacent the drive wheel transmission device. Because of this, particularly in the case of an FF vehicle, ~~the~~ interference ~~toward~~ with the front wheels is reduced, ~~and~~ the mountability on a vehicle ~~can be~~ is improved, ~~such as the~~ and the steering angle ~~being~~ is greatly increased, ~~for example.~~

Further, since the reduced ~~rotation~~ speed output to the ~~planetary gear unit PU from the~~ first second planetary gear unit PR is ~~made to~~ be engaged and disengaged by the brake B3, the number of ~~parts~~ component B (for example drum-shaped members and so forth) can be reduced as compared to the case wherein, for example, a clutch C1 is provided. Further, the brake B3 can ~~configure~~ connect with an oil line directly from the case 3, and therefore the configuration of the oil line can be simplified as compared to the case wherein, for example, a clutch C1 is provided.

Further, the automatic transmission device 1_{22} according to the present embodiment ~~is a transmission device that~~ is directly coupled ~~at~~ in fifth speed forward. Therefore, ~~at~~ in first speed forward and fourth speed forward, the gear ratio can be ~~specified in a detailed manner~~ better not for maximum efficiency, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine can be ~~utilized with better revolutions~~ operated more efficiently, and ~~this contributes to increased~~ fuel economy ~~of the vehicle~~ can be improved while running at a low to medium speed.

~~Now, in the event that~~ If a clutch is ~~configured in~~ located

between the planetary gear units PR and ~~the planetary gear unit~~ PU for example, the length of the ~~linking member (particularly the~~ transmitting members that links the planetary gear units PR and ~~the planetary gear unit~~ PU becomes longer ~~in the~~ axially ~~direction~~, and since this linking member ~~is for~~ transmitting the reduced speed rotation, the thickness of the member must be increased so as to withstand the high torque ~~this~~, and therefore the weight also increases. Therefore, an object of the present invention is to provide an automatic transmission that can shorten the distance between the speed reduction (second) planetary gear unit PR first and the planetary gear unit PU, and avoid ~~reduce the~~ increase in weight.

In this twenty-second ~~With the present~~ embodiment, ~~In particular,~~ the clutch C2 is disposed on the ~~opposite~~ side ~~in the axial direction~~ of the second planetary gear unit ~~PU from~~ the planetary gear unit PR axially opposite first PR, and, therefore, ~~providing~~ a clutch between the planetary gear units PR and ~~the planetary gear unit~~ PU is not necessary, and the length of the ~~linking member, particularly the~~ transmitting member 230 can be made that much shorter. Therefore, ~~an~~ increase in weight of the automatic transmission as a whole can be ~~prevented~~ avoided.

~~Twenty-third Embodiment~~

~~Below, the~~ A twenty-third embodiment, which is a partial modification of the eighteenth embodiment will now be described, with reference to Fig. 41. ~~Fig. 41 is a schematic cross-~~

~~sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the twenty-third embodiment. Now~~, Components of the twenty-third embodiment which are the same as those of the ~~twenty-third~~ eighteenth embodiment ~~will be~~ are denoted ~~with~~ by the same reference numerals, and description thereof omitted, except for ~~partial~~ modifi~~cations~~ed components.

As Fig. 41 illustrates, the automatic transmission ~~device~~ 1_{23} of the ~~automatic transmission relating to the~~ twenty-third embodiment ~~is a modification of the~~ differs from the eighteenth embodiment in the configuration of the clutch C1 and the second planetary gear unit PR. ~~In other words~~, More specifically, the second planetary gear unit PR and the clutch C1 are ~~configured to~~ located on one side (the right side ~~of~~ in the diagram) of the first planetary gear unit PU, and the counter gear 5 is ~~configured in~~ located between ~~this~~ the planetary gear units PR and ~~the planetary gear unit~~ PU. The twenty-third embodiment also differs in that the locations of ~~, and further,~~ the clutch C2 and the brake B2 ~~change places with the clutch C3,~~ are switched as compared to ~~that of~~ the automatic transmission ~~device~~ 1_{18} of the ~~automatic transmission of the~~ eighteenth embodiment (see Fig. 30).

Within the automatic transmission ~~device~~ 1_{23}, mounted on the ~~inner circumference side of the~~ input shaft 2 is ~~configured~~ a multi-disc clutch C3 comprising ~~an oil pressure~~ a hydraulic servo 13, friction plates 73, a clutch drum ~~shaped member~~ 225 ~~that forms a clutch drum~~, a hub unit 226 connecting to sun gear S2, and, located ~~on the outer circumference side~~ radially outward of clutch C3, is ~~comprised~~ a multi-disc

clutch ~~C8~~ C1 comprising ~~an oil pressure~~ a hydraulic servo 11, ~~4~~ 4 friction plate~~s~~ 71, a ~~drum-shaped member~~ clutch drum 221 ~~that forms a clutch drum~~, and a hub unit 224.

~~Now,~~ The oil chamber of the ~~oil pressure~~ hydraulic servo 13 is ~~linked~~ connected to the oil line 2a formed on the ~~above mentioned~~ input shaft 2, and this oil line 2a ~~is extended from one edge of the case 3, and~~ is ~~linked~~ connected to the oil line 91 of the boss ~~unit~~ 3a, ~~provided on the input shaft 2 in a sleeve form,~~ ~~and this~~ which oil line 91, in turn, is ~~linked~~ connected to the oil pressure control~~ler device~~ not illustrated. ~~In other words~~, Thus, ~~since~~ because the ~~above mentioned oil pressure~~ hydraulic servo 13 is ~~configured~~ mounted on the input shaft 2, simply providing one set of seal rings 81 ~~that seal~~ between the boss ~~unit~~ 3a ~~of the case 3~~ and the input shaft 2 ~~configures an~~ serves to connect oil ~~line~~ supply from the oil pressure control~~ler device not illustrated~~ to the oil chamber of the ~~oil pressure~~ hydraulic servo 13.

Further, the oil chamber of the ~~above mentioned oil pressure~~ hydraulic servo 11 is ~~linked~~ connected to the oil line 92 of the ~~above mentioned~~ boss ~~unit~~ 3a, ~~and this~~ which oil line 92, in turn, is ~~linked~~ connected to the oil pressure control~~ler device not illustrated. In other words~~, Thus, ~~regarding the above mentioned oil pressure~~ for the hydraulic servo 11, simply by providing one set of seal rings 80 ~~that seal~~ between the boss ~~unit~~ 3a ~~of the case 3~~ and the clutch ~~drum-shaped member~~ 221, ~~configures an~~ supply oil ~~line~~ from the oil pressure control~~ler device, not illustrated,~~ is connected to the oil chamber of the ~~oil~~ hydraulic

~~pressure~~ servo 11.

The ~~above-mentioned~~ input shaft 2 is connected to the clutch drum~~-shaped member~~ 225 of the clutch C3, and the front ~~edge~~ portion of the inner ~~circumference side~~ surface of this clutch drum~~-shaped member~~ 225 is ~~configured~~ splined with the friction plates 73, ~~that is made capable of engaging with the oil pressure servo 13 for the clutch C3. The inner circumference side of this~~ friction plate~~s~~ 73 ~~is~~ are intermeshed with friction plates splined to the hub unit 226, and ~~this~~ hub unit 226 is connected to the sun gear S2.

~~Further, the above-mentioned~~ The input shaft 2 ~~is connected to~~ rotatably supports the ~~above-mentioned~~ clutch drum~~-shaped member~~ 221, ~~so as to be capable of rotating, and on the~~ The inner ~~circumference side~~ surface of this drum~~-shaped member~~ clutch 221 is ~~configured~~ splined to the friction plates 71 of the clutch C1 which is ~~capable of engaging by the oil pressure~~ operated by the hydraulic servo 11 ~~for the clutch C1, splined~~, and the ~~inner circumference side of the~~ friction plates 71 ~~of this clutch C1 is connected by~~ are intermeshed with friction plates splining to the hub unit 222 that is connected to the ring gear R1. ~~This~~ The ring gear R1 is rotatably supported by the boss ~~unit~~ 3a ~~so as to be capable of rotating,~~ via ~~this~~ hub unit 222. ~~Further,~~ The sun gear S1 is connected to the ~~above-mentioned~~ input shaft 2, and the carrier CR1 is fixed to and supported by the boss ~~unit~~ 3a via the side plate. Also, the ~~above-mentioned~~ clutch drum~~-shaped member~~ 221 is connected to the sun gear S3 via the transmitting member 230, ~~and this transmitting member 230 is connected to the above-~~

~~mentioned sun gear S3.~~

~~On the other hand,~~ On the boss ~~unit~~ 3b of the case 3 is in the form of a sleeve fitted on one end of that ~~is provided~~ on the input shaft 2 ~~in a sleeve form~~, and ~~is~~ extending as a sleeve on the end of input shaft 2 ~~extended from the other side~~ opposite ~~from the above-mentioned~~ is a boss ~~unit~~ 3a, which supports ~~is comprised~~ a multi-disc clutch C1 comprising a hydraulic ~~an oil pressure~~ servo 12, friction plates 72, a clutch drum ~~shaped member~~ 223 ~~that forms a clutch drum~~, and a hub unit 224. The oil chamber of hydraulic ~~this oil pressure~~ servo 12 is connected ~~linked~~ to ~~the~~ oil line 93 of the boss ~~unit~~ 3b, which ~~and this~~ oil line 93, in turn, is connected ~~linked~~ to the oil pressure controller ~~device not illustrated~~. In other words, the above-mentioned ~~oil~~ hydraulic ~~pressure~~ servo 12 is connected to ~~constructing an oil line from~~ the oil pressure controller ~~device not illustrated to the oil pressure servo 12~~ by one set of seal rings 84 ~~that seal~~ between the boss ~~unit~~ 3b ~~of the case 3~~ and the clutch drum ~~shaped member~~ 223.

~~Further, on the~~ A front ~~edge~~ portion surface of the inner ~~circumference side~~ of the clutch drum ~~shaped member~~ 223 ~~of this clutch C2~~ is splined to friction plates 72 which are intermeshed with friction ~~capable of engaging by the oil pressure servo 12 of the clutch C2, and this friction plate~~ plates ~~72 is~~ splined to ~~with the~~ front ~~edge~~ portion surface of the outer ~~circumference side~~ of the hub unit 224. Further, ~~on the~~ radially outward ~~outer circumference side~~ of the clutch C2 is ~~configured~~ a multi-disc brake comprising an oil pressure servo 15 and friction plates 75, and ~~on~~ the outer circumferential surface ~~circumference side~~ of ~~this~~ hub unit 224 is splined to friction plates 75 that can be

~~retained~~ engaged by the ~~oil pressure~~ hydraulic servo 15 ~~for the brake B2, and~~ operation of

~~A~~Also, this hub unit 224 is connected to the sun gear S2.

~~On the other hand, on the outer circumference side~~ Radially outward of the planetary gear unit PU is ~~configured~~ a multi-disc brake B1 comprising ~~an oil pressure~~ 2 hydraulic servo 14, ~~a~~ friction plates 74, and a hub unit 228. The side plate of the carrier CR2 of the ~~above-mentioned~~ first planetary gear unit PU is connected to the hub unit 228 that is splined ~~with~~ to the friction plates 73 of the above-mentioned brake B1, and further, the hub unit 228 is connected to the inner race of the one-way clutch F1. The sun gear S3 is meshed with the short pinion PS of this carrier CR2. ~~Then,~~ The long pinion PL of this carrier CR2 meshes with the ~~above-mentioned~~ sun gear S2 and the ring gear R2, and to one edge of this ring gear R2 is connected the ~~linking~~ transmitting member 227, and ~~this~~ ring gear R2 is linked to the counter gear 5 via this ~~linking~~ transmitting member 227.

The operations of the automatic transmission ~~device~~ 1_{23}, ~~based on the above-mentioned construction,~~ of this Twenty-third embodiment are similar to ~~that~~ those of the eighteenth embodiment (see Fig. 31 and Fig. 32), and, according ~~to~~ description thereof will be ~~omitted~~ not repeated here.

~~As described above, according to~~ In the automatic transmission ~~device~~ 1_{23} ~~relating to the present invention~~ of this embodiment, due to the second planetary gear unit PR and the clutch C3 being ~~configured~~ located on one side ~~in the axial direction~~ of the first planetary gear unit PU, and the clutch C2 being ~~configured~~ located

on the ~~other~~ side ~~in the~~ axial ~~direction~~ of the planetary gear unit PU, the planetary gear PR and ~~the planetary gear unit~~ PU can be ~~configured~~ closely together, compared to the case wherein, for example, two clutches C2 and C3 are ~~configured in~~ between the planetary gear PR and ~~planetary gear unit~~ PU, and the transmitting member 230 for transmitting reduced rotation can be relatively shorte~~ned~~. By doing so, the automatic transmission can be made more compact and more lightweight. Further, because the inertia force ~~of~~ inertia can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced. Further, compared to the case wherein three clutches C1, C2, C3 are ~~configured~~ on one side of the planetary gear unit PU, the oil lines (for example, 2a, 91, 92, 93) that supply the oil pressure servos 11, 12, and 13 of these clutches C1, C2, C3 can be constructed easily, ~~and~~ the manufacturing process can be simplified and the costs ~~brought down~~.

Further, since the ~~oil pressure~~ servo 13 is ~~provided~~ on the input shaft 2, one set of seal rings 81 ~~seal the case 3~~ ~~the~~ and supply oil to the oil lines 2a provided within input shaft 2, and therefore oil can be supplied to the oil chamber of oil pressure servo 13 without providing ~~the~~ seal rings between, for example, the input shaft 2 and the ~~oil pressure~~ servo 12. Further, the ~~oil pressure~~ servos 11 and

12 can supply oil from the boss ~~units~~ 3a, 3b extended from the case 3, without passing through other ~~parts for example, and therefore can supply oil by providing one set of seal~~ rings 80, 84. Therefore, oil can be supplied simply by providing one set of seal rings 81, 80, 84 for each of the ~~oil pressure~~ hydraulic servos 11, 12, and 13, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, because the clutch C3 is ~~configured on the inner circumference side~~ located radially inward of the clutch C1, the clutch C1, which must transmit a relatively large torque in order to transmit the reduced speed rotation, can be ~~configured~~ located on the outer circumference side, and ~~this clutch C1 and the oil pressure~~ its hydraulic servo 11 ~~thereof~~ can have an increased diameter. ~~Particularly~~ Thus, the pressure receiving area of the oil chamber of the ~~oil pressure~~ hydraulic servo 11 can be enlarged, and the ~~capacity capable of~~ torque transmitting capacity of this clutch C1 can be increased. By configuring the clutch C3 ~~which can~~ to have a smaller capacity ~~for~~ torque transmitting than ~~compared to the~~ clutch C1, the automatic transmission can be made more compact.

~~Further, because~~ Because when clutch C2 ~~is a clutch that engages while at first speed reverse, when this clutch 2~~ is engaged in ~~at~~ first speed reverse, the transmitting member 230 rotates in the opposite direction while the hub unit 224 that

connects ~~this~~ clutch C2 and the sun gear S2 rotate ~~at~~ in the same ~~rotation~~ direction as the input shaft 2 ~~by engaging this clutch C2, which may lead to cases wherein the rotation difference of~~ the transmitting member 230 and the hub unit 224 ~~becomes~~ rotate at greatly different speeds, but because this clutch C2 is located on the ~~opposite~~ side of the ~~planetary gear PR, via~~ first unit PU opposite to second the planetary gear unit PU, the transmitting member 230 and the hub hunt 224 can be ~~configured~~ spaced apart from one another. Compared to the case wherein, for example, those ~~parts~~ components come in contact ~~due to~~ in a multiple axis construction, the decrease in efficiency of the automatic transmission caused by the friction produced by the relative rotation between ~~those parts~~ these components can be ~~prevented~~ avoided.

Further, because the counter gear 5 is ~~configured in the axial direction~~ located between the planetary gear unit PU and ~~the planetary gear~~ PR, the counter gear 5 can be ~~configured~~ located in approximately the center ~~in the~~ axial ~~direction~~ of the automatic transmission. For example, ~~when~~ enlargement of the automatic transmission toward the rear of ~~is mounted on~~ the vehicle ~~enlarging towards one direction of the axis (particularly in the rear direction~~ (when the input side ~~from~~ facing the drive source is the front ~~direction~~) ~~can be prevented~~ is not necessary because the counter gear 5 is mounted ~~to match~~ adjacent the drive wheel transmission device. Because of this, particularly in the case of an FF vehicle, ~~the~~ interference ~~toward~~ with the front wheels is reduced, ~~and~~ the mountability on a vehicle ~~can be~~ is improved, ~~such as the~~ and

the steering angle ~~being~~ can be greatly increased~~, for example~~.

Further, the automatic transmission ~~device~~ 1_{23} according to the present embodiment is ~~a transmission device that is~~ directly coupled ~~at~~ in fifth speed forward. Therefore, ~~at~~ in first speed forward and fourth speed forward, the gear ratio can be ~~specified in a detailed manner~~ determined for greater efficiency, ~~and particularly~~ when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine can be ~~utilized with better revolutions~~ operated more efficiently, and ~~this contributes to increased~~ fuel economy of the vehicle can be increased when ~~while~~ running at a low to medium speed.

~~Now, the linking member (in particular~~ The transmitting member~~)~~ for linking the planetary gear units PR and ~~the planetary gear unit~~ PU requires rigidity to withstand the reduced speed torque that is input. For example, ~~in the case of configuring~~ a clutch that engages at a slow to medium speed ~~and~~ or a clutch that engages and disengages reduced speed rotation ~~on the inner circumference side~~ radially inward and that is located of the linking member~~, the clutches~~ must have a large capacity, therefore ~~an~~ and must have ~~appropriate~~ a diameter ~~to~~ correspond ~~with~~ ing to this required large capacity ~~becomes necessary~~. Therefore, in the event that the ~~linking~~ transmitting member ~~is the type that~~ passes ~~on the outer circumference side~~ radially outward of ~~this type of~~ such a clutch, even an larger diameter ~~than the necessary diameter measurement of those~~ for the clutches becomes necessary, ~~the~~ the diameter ~~measurement~~ of the ~~linking~~ transmitting

member is enlarged more than necessary, and the automatic transmission as a whole becomes greater in the direction of the diameter. Therefore an object of the present embodiment is to reduce the enlargement of the diameter measurement, and provide a compact automatic transmission.

According to the present embodiment, all clutches can be configured without enlarging the diameter measurement of the linking member, by configuring a clutch C3 with a small capacity on the linking member, particularly on the inner circumference side of the transmitting member 230.

Twenty-fourth Embodiment

Below, the twenty-fourth embodiment which is a partial modification of the twenty-third embodiment will be described with reference to Fig. 42. Fig. 42 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the forty-second embodiment. Now, components of the twenty-fourth embodiment which are the same as those of the twenty-third embodiment will be denoted with the same reference numerals, and description thereof omitted, except for partial modifications.

As Fig. 42 illustrates, the automatic transmission device 1_{24} of the automatic transmission relating to the twenty-third embodiment is modification of the configuration of the clutch C1, compared to that of the

automatic transmission ~~device~~ 1_{23} of the ~~automatic~~ transmission of the eighteenth embodiment (see Fig. 41).

Within the automatic transmission ~~device~~ 1_{24}, the clutch C1 is ~~configured~~ located on the side of the second planetary gear unit PR on the ~~one~~ opposite (right side on the diagram) ~~from~~ the first planetary gear unit PU. ~~The~~ A front ~~edge~~ portion of the inner circumference ~~side~~ tial surface of the drum ~~shaped member~~ 221, ~~of this clutch C1~~ which is connected to the input shaft 2, ~~On the front edge of the inner circumference side of the drum-shaped member 221 of this clutch C1 is~~ is splined ~~with the~~ to friction plates 71 which are intermeshed with friction plates ~~and the inner circumference side of this friction~~ plate 71 ~~is~~ splined ~~with~~ to the hub unit 222. The hub unit 222 is connected to the sun gear S1 of the second planetary gear unit PR.

~~Further,~~ The side plate of the carrier CR1 of the second planetary gear unit PR is fixed to and supported by the case 3. ~~Also,~~ The ring gear R1 is connected to the sun gear S3 by the transmitting member 230, ~~and this transmitting member 230 is connected to the sun gear S3.~~ ~~Now,~~ The clutch C3 comprises ~~ing an oil pressure~~ 2 hydraulic servo 13, friction plates 73, a drum ~~shaped member~~ 225, and a hub unit 226 and is located ~~configured on the inner circumference side~~ radially inward of the ~~above mentioned~~ transmitting member 230, that is to say, enclosed within ~~this~~ transmitting member 230.

The operations of the automatic transmission ~~device~~ 1_{24}, ~~based on the above-mentioned construction~~ are the same as

~~those that~~ of the nineteenth embodiment (see Fig. 34 and Fig. 35), and ~~according~~ description will be ~~omitted~~.

~~As described above, according to~~ the automatic transmission ~~device~~ 1_{24} ~~relating to the present invention,~~ because the planetary gear PR and the clutch C3 ~~is configured~~ on one side ~~in the axial direction~~ of the planetary gear unit PU, and the clutch C2 is ~~configured~~ on the other side ~~in the axial direction~~ of the planetary gear unit PU, the planetary gear PR and ~~the planetary gear unit~~ PU can be ~~configured~~ closely together, compared to the case wherein, for example, two clutches C2 and C3 are ~~configured in~~ between the planetary gear PR and ~~planetary gear unit~~ PU, and the transmitting member 230 for transmitting reduced rotation can be relatively ~~short~~ shorter. By doing so, the automatic transmission can be made more compact and more lightweight. Further, because the inertia (force) ~~of inertia~~ can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced. Further, compared to the case wherein three clutches C1, C2, C3 are ~~configured~~ on one side of the planetary gear unit PU, the oil lines (for example, 2a, 91, 92, 93) that supply the ~~oil pressure~~ servos 11, 12, and 13 of these clutches C1, C2, C3 can be constructed ~~easily~~, ~~and~~ the manufacturing process can be simplified and the costs ~~brought down~~.

Further, because the ~~oil pressure~~ hydraulic servo 13 is ~~provided~~ mounted on the input shaft 2, one set of seal rings 81 seal the case 3 ~~and supply oil to~~ with the oil lines 2a provided within input shaft 2, ~~and therefore oil can be~~ to supplied oil to the oil chamber of ~~oil pressure~~ hydraulic servo 13 without providing ~~the~~ seal rings between, for example, the input shaft 2 and the ~~oil pressure~~ hydraulic servo 13. Further, the ~~oil pressure~~ hydraulic servos 11 and 12 can supply oil receive of directly from the boss ~~units~~ es 3a, 3b extended ing from the case 3, without passing through other ~~parts for example~~ components, and therefore ~~can~~ the supply oil can be connected by providing one set of seal rings 80, 84. Therefore, oil can be supplied simply by providing one set of seal rings 81, 80, 84 each for of the ~~oil pressure~~ hydraulic servos 11, 12, and 13, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, ~~since~~ when the clutch C2 ~~is a clutch that engages while at first speed reverse, when this clutch 2~~ is engaged ~~at~~ in first speed reverse, the transmitting member 230 rotates in the opposite direction while the hub unit 224 that connects this clutch C2 and the sun gear S2 rotates ~~at~~ in the same ~~rotation~~ direction as the input shaft 2, ~~by engaging this clutch C2.~~ Accordingly, the case may occur wherein the ~~rotation difference of~~ the transmitting member 230 and the hub unit 224 ~~becomes~~ rotate at greatly different ~~great, but~~ speeds. However, because this clutch C2 is located on the ~~opposite~~ first side of the planetary gear ~~PR, via~~ unit PU opposite the second planetary gear unit PR

~~The~~, the transmitting member 230 and the hub hunt 224 can be ~~configured~~ spaced apart from one another. Compared to the case wherein, for example, those ~~parts~~ components come in contact due to a multiple axis construction, ~~the~~ a decreased efficiency of the automatic transmission caused by the friction produced by the relative rotation between those ~~parts~~ components can be ~~prevented~~ avoided.

Further, because the counter gear 5 is ~~configured in the~~ located axial ~~direction~~ between the planetary gear unit PU and ~~the planetary gear PR~~, the counter gear 5 can be ~~configured~~ located in approximately the center ~~in the~~ axial ~~direction~~ of the automatic transmission. For example, when the automatic transmission is mounted on ~~the~~ a vehicle, ~~enlarging~~ weight towards ~~one direction of the axis (particularly in~~ the rear ~~direction~~ when the input side from the drive source is the front ~~direction~~) ~~can be prevented~~ is not necessary because the counter gear 5 is mounted to ~~match~~ mate with the drive wheel transmission device. Because of this, particularly in the case of an FF vehicle, ~~The~~ interference ~~toward~~ with the front wheels is reduced, ~~and~~ the mountability on a vehicle ~~can be~~ is improved, ~~such as~~ and the steering angle ~~being~~ can be greatly increased. ~~for example.~~

~~Further,~~ If the clutch C1 ~~is~~ were to be placed between the ring gear R1 and the sun gear S3, for example, it would be required to ~~must be~~ engaged and disengaged, and ~~becomes~~ to be relatively large, but by placing clutch C1 between the input shaft 2 and the sun gear S1, the engaging and disengaging of the

rotation of the input shaft 2 ~~from this~~ by clutch C1 ~~causes the~~ indirectly reduced speed rotation output from the ring gear R1 of the planetary gear PR ~~to be~~ engaged and disengaged, ~~and~~ the clutch C1 can be made more compact, and therefore the automatic transmission can be made more compact.

Further, the automatic transmission device 1_{24} according to the present embodiment is ~~a transmission device that is~~ directly coupled ~~at~~ in fifth speed forward. Therefore, ~~at~~ in first speed forward and fourth speed forward, the gear ratio can be ~~specified in a detailed manner, and particularly~~ more precisely set to improve efficiency and when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine can be ~~utilized with better revolutions~~ operated more efficiently, and ~~this contributes to increased~~ better fuel economy ~~of the vehicle~~ is achieved while running at a low to medium speed.

~~Now, the linking member (in particular~~ In this embodiment also, the transmitting member ~~for~~ unit linking the planetary gear PR and ~~the planetary gear unit~~ PU requires rigidity to withstand the reduced speed torque that is input. For example, ~~in the case of configuring~~ a clutch that engages at a slow to medium speed ~~and~~ or a clutch that engages and disengages reduced speed rotations and that is located radially on the inner ~~circumference~~ side of the ~~linking~~ transmitting member, ~~the clutches~~ must have a large capacity, therefore an appropriate diameter ~~to correspond with this~~ for such a large capacity becomes necessary. Therefore, in the event that the ~~linking~~ transmitting

member ~~is the type that~~ passes on the radially ~~circumference~~ outer side of this type of clutch, in even ~~a~~ larger diameter ~~than the necessary diameter measurement of~~ for these clutches becomes necessary, ~~in~~ the diameter ~~measurement~~ of the ~~linking~~ transmitting member is enlarged more than necessary, and the diameter of the automatic transmission as a whole ~~becomes greater in the direction of the diameter.~~ is increased. Therefore an object of the present embodiment is to reduce ~~the enlargement of~~ the diameter ~~measurement,~~ and to provide a more compact automatic transmission.

According to the present embodiment, all clutches can be configured ~~without~~ to avoid enlarging the diameter ~~measurement~~ of the ~~linking~~ transmitting member, by ~~configuring~~ locating a clutch C3 with a small capacity on the ~~linking member, particularly on the~~ radially inner ~~circumference~~ side of the transmitting member 230.

Twenty-fifth Embodiment

~~Now, the~~ twenty-fifth embodiment, which is a partial modification of the twenty-third embodiment will now be described with reference to Fig. 43. ~~Fig. 43 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the twenty-fifth embodiment. Now,~~ Components of the twenty-fifth embodiment which are the same as those of the twenty-third embodiment ~~will be~~ are denoted by the same reference numerals, and description thereof ~~omitted, except for partial modifications.~~ will not be repeated here.

As Fig. 43 illustrates, the automatic transmission device 1_{25} of the automatic transmission relating to the twenty-third embodiment configures a brake B3 instead of the clutch C3, and makes the carrier CR1 of the planetary gear unit PR capable of being fixed by the brake B3, as compared to that of the automatic transmission device 1_{23} of the automatic transmission of the twenty-third embodiment (see Fig. 41).

Within this automatic transmission device 1_{25}, the brake B3 is configured on the opposite side (the right side of the diagram) of the planetary gear unit PR of the planetary gear unit PR. This brake B3 comprises an oil pressure servo 16, a friction plate 76, and a hub unit 233. The hub unit 233 of this brake B3 is connected to the carrier CR1, and this carrier CR1 is supported by the input shaft 2 so as to be capable of rotating. Further, the sun gear S1 is connected to the input shaft 2. Also, the ring gear R1 is connected to the transmitting member 230, and is connected to the sun gear S3 via this transmitting member 230. Now, the clutch C3, comprising an oil pressure servo 13, a friction plate 73, a drum-shaped member 225, and a hub unit 226, is configured on the inner circumference side of the above-mentioned transmitting member 230, that is to say, is enclosed within this transmitting member 230.

The operations of the automatic transmission device 1_{25},

~~based on the above mentioned construction~~ are the same as ~~that~~ those of the twentieth embodiment (see Fig. 37 and Fig. 38), and according description will be ~~omitted~~ thereof not repeated here.

~~As described above, according to~~ In the automatic transmission ~~device~~ 1_{25} ~~relating to the present invention~~ of this twenty-fifth embodiment, since the planetary gear unit PR and the clutch C3 are ~~configured~~ located on one ~~side in the~~ axial ~~direction~~ of the first planetary gear unit PU, and the clutch C2 is ~~configured~~ located on the other axial ~~side in the axial direction~~ of the first planetary gear unit PU, the planetary gear units PR and ~~the planetary gear unit~~ PU can be ~~configured~~ located more closely together, as compared to the case wherein, for example, two clutches C2 and C3 are ~~configured in~~ located between the planetary gear units PR and ~~planetary gear unit~~ PU, and the transmitting member 230 for transmitting the reduced speed rotation can be relatively shortened. ~~By doing so~~ In this manner, the automatic transmission can be made more compact and more lightweight. Further, because the inertia (~~force~~ inertia) can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced.

Further, since the ~~oil pressure~~ hydraulic servo 13 is ~~provided~~ mounted on the input shaft 2, one set of seal rings 81 serves to seal the case 3 ~~and supply oil~~ to the oil lines 2a provided within input shaft 2, and therefore oil can be supplied to the oil chamber of ~~oil pressure~~ hydraulic servo 13 without providing ~~the~~ seal

rings between, for example, the input shaft 2 and the ~~oil pressure~~ hydraulic servo 12. Further, the ~~oil pressure~~ hydraulic servo 12 can receive supply of oil from the boss ~~unit~~ 3b extending from the case 3, without passing through other ~~parts for example~~ components, and ~~therefore can~~ supply oil of is secured by providing one set of seal rings 84. Therefore, oil can be supplied simply by providing one set of seal rings 81, 84 each for the ~~oil pressure~~ hydraulic servos 12, 13, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, ~~since the clutch C2 is a clutch that engages while at first speed reverse,~~ when ~~this~~ clutch C2 is engaged in at first speed reverse, the transmitting member 230 rotates in the opposite direction while the hub unit 224 that connects this clutch C2 and the sun gear S2 rotates in the same ~~rotation~~ direction as the input shaft 2 ~~by engaging this clutch~~ C2, and a ~~case may occur wherein~~ the ~~rotation~~ difference in speeds between the transmitting member 230 and the hub unit 224 will ~~become~~ be great, however ~~but~~ because this clutch C2 is located on the ~~opposite~~ first side of the planetary gear unit PU opposite ~~PR, via~~ the second planetary gear unit PR, the transmitting member 230 and the hub hunt 224 can be ~~configured~~ spaced apart from one another. Compared to the case wherein, for example, ~~those parts~~ these components come in contact ~~due to~~ in a multiple axis construction, the decreased in efficiency of the automatic transmission caused by the friction produced by

the relative rotation between those ~~parts~~ components can be ~~prevented~~ avoided.

Further, since the counter gear 5 is ~~configured in the axial direction between~~ located axially intermediate the planetary gear unit PU and ~~the planetary gear~~ PR, the counter gear 5 can be ~~configured~~ located in approximately the center ~~in the~~ axial ~~direction~~ of the automatic transmission. ~~For example, when the automatic transmission is mounted on the vehicle,~~ Again in this embodiment, there is no need for enlarging ~~one direction of the axis (particularly in the rear direction~~ element towards the front ~~direction~~) ~~can be prevented~~ because the counter gear 5 is mounted to ~~match~~ mate with the drive wheel transmission device. ~~Because of this~~ Thus, particularly in the case of an FF vehicle, ~~the~~ interference ~~toward~~ with the front wheels is reduced, ~~and the~~ mountability on a vehicle ~~can be~~ is improved, ~~such as the~~ and the steering angle ~~may~~ can be greatly increased, ~~for example.~~

Further, since the reduced ~~rotation~~ speed rotation output to the first planetary gear unit PU from the second planetary gear unit PR is ~~made to be~~ engaged and disengaged by the brake B3, the number of ~~parts~~ components (for example drum-shaped members and so forth) can be reduced as compared to the case wherein, for example, a clutch C1 is provided. Further, the brake B3 can be ~~configure~~ with an oil line directly ~~from~~ connected in the case 3, and therefore the configuration of the oil line can be simplified as compared to the case wherein, for example, a clutch C1 is ~~provided~~ used.

Further, the automatic transmission ~~device~~ 1_{25} according

to the ~~present~~ twenty-fifth embodiment is ~~a transmission device that is~~ directly coupled ~~at~~ in fifth speed forward. Therefore, ~~at~~ in first speed forward and fourth speed forward, the gear ratio can be ~~specified in a detailed manner~~ better set for efficiency, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine can be ~~utilized with better revolutions~~ operated more efficiently, and ~~this contributes to increased~~ fuel economy ~~of the vehicle while~~ can be increased in running at a low to medium speed.

~~Now, the linking member (in particular~~ In this embodiment also, the transmitting member ~~for~~ units linking the planetary gear PR and ~~the planetary gear unit~~ PU requires rigidity to withstand the reduced speed torque that is input. ~~For example~~, Further, in the case of ~~configuring~~ a clutch that engages at a slow to medium speed ~~or~~ and a clutch that engages and disengages reduced speed rotations and located that is on the ~~inner circumference~~ radially side of the ~~linking~~ transmitting member, the clutch must have a large capacity and therefore a ~~appropriate~~ large diameter to ~~correspond with this~~ provide the required torque transmitting capacity ~~becomes necessary~~. Therefore, in the event that the ~~linking~~ transmitting member is the type that passes on the ~~outer circumference~~ radially outward side of this type of clutch, an even larger diameter ~~than the necessary diameter measurement of those clutches~~ becomes necessary, ~~and~~ the diameter ~~measurement~~ of the ~~linking~~ transmitting member must be further ~~is~~ enlarged ~~more than necessary~~, and the automatic transmission as a whole must have a ~~becomes~~ greater ~~in the direction of~~

diameter. Therefore, an object of the present embodiment is to avoid enlargement of the diameter, and to provide a more compact automatic transmission.

In this twenty-fifth embodiment, all clutches can be accommodated without enlarging the diameter of the linking member, because clutch C3 with a small capacity is located radially inward of the transmitting member 230.

While the above first through twenty-fifth embodiments of the present invention were described as being applicable to a torque converter as an automatic transmission having the invention is not limited so, and any motion-starting device may be used that would transmit the torque (rotation) at start of movement. Further, while the foregoing embodiments have been described as mounted on a vehicle with an engine as a drive source having the invention is not limited so, and any drive source may be used as a matter of course, and the present invention may be applied to a hybrid vehicle.

Further, the above described automatic transmission is favorable for use in a FF vehicle, but is not limited to this, and can be used in a FR vehicle, a four-wheel drive vehicle, or vehicles with other types of drive systems.

Further, the above first through twenty-fifth embodiments have been described as having a double pinion planetary gear unit as second planetary gear unit, i.e. PR as a reduced

speed
rotation output means, but ~~should~~ not ~~be~~ limited ~~to this~~, again the invention is so unit and a single pinion planetary gear may also be used.

Further, the above first through twentieth embodiments and the twenty-third through twenty-fifth embodiments ~~were~~ have been described as having ~~using~~ of the rotation of the input shaft 2 into the sun gear S1 of ~~this~~ planetary gear unit PR, ~~and by~~ with fixing the rotation of the carrier CR1, whereby the ring gear R1 rotates at a reduced ~~rotations~~ speed. However, the rotation of the sun gear S1 may be fixed, with the rotation of the input shaft 2 input to the carrier CR such that the ring gear R1 rotates at a reduced ~~rotations~~ speed.

Further, the first embodiment and the second embodiment have been described with the input side and the output side of the automatic transmission interchanged. ~~but should not be limited to this, and arrangements may be made wherein the~~ Likewise, the input side and the output side may be ~~are~~ interchanged for the ~~in an~~ automatic transmission according to the other embodiments. ~~as well.~~

~~Industrial Applicability~~

As described above, the automatic transmission according to the present invention is used to advantage ~~beneficial mounted~~ on vehicles such as automobiles, trucks, busses, and so forth, and is particularly suitable for use with vehicles which require reduction in size and reduction in weight ~~from~~

~~mountability to the vehicle,~~ and further require reduction in shock upon changing speeds.

ABSTRACT

A planetary gear unit PR and a clutch C3 for outputting reduced speed rotations and a clutch C1 for connecting and disconnecting the input of rotation of an input shaft to a sun gear S2 are located on one axial side of a planetary gear unit PU, and a clutch C2 for connecting and disconnecting the input of rotation of the input shaft to the carrier CR2 is located on the axially opposite side of the planetary gear unit PU. By doing so, as compared to a case wherein, for example, a clutch C1 and clutch C2 are both located between a pair of planetary gear units PR and planetary gear units PU, the planetary gear units PR and planetary gear unit PU can be located more closely together, and the member 30 that transmits the reduced speed rotations from the planetary gear unit PR to the planetary gear unit PU can be made shorter. Further, compared to the case wherein, for example, the clutches C1, C2, C3 are located on one side of the axial direction, the construction of the oil lines is simplified. of the planetary gear units